School of Public Health

Breastfeeding and perceptions of breast shape changes in Australian and Japanese women

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Declaration

To the best of my knowledge and belief this thesis contains no materials previously published by any other person except where due acknowledgement has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature:

Date:

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This thesis is dedicated to my beloved daughter,

Mirai Inoue

who

always gives smiles, love, and support.

Abstract

This thesis examines infant feeding practices, including knowledge and attitudes towards breastfeeding, factors that influence the duration of breastfeeding, and breastfeeding outcomes in relation to postpartum women's body image, particularly perceived changes of breast shape in Australian and Japanese women.

From previous studies, the number of women who desire to be slim after their childbirth has been increasing in recent years, and it is hypothesised that their concerns about body image may be associated with breastfeeding outcomes. It has been found that the Asian women have more distorted body images than their Caucasian counterparts. Breastfeeding gives many benefits to health of women and child, and the benefits may be greater with longer breastfeeding duration. Nevertheless, the duration of 'exclusive breastfeeding' is still less than the recommendations in most countries. There have been only a limited number of studies investigating breastfeeding outcomes related to postpartum women's body image.

This thesis contains two studies. In the first study, a cross-sectional survey was conducted in 2007 at Himeji city, Japan, in order to describe infant feeding practices and to identify factors that are associated with breastfeeding duration. The survey was a self-administered questionnaire included in a letter from the Himeji City Health Department offering free health checks for infants at 18 months of age. The second study was a prospective cohort study with interviews on seven occasions (4, 10, 16, 22, 32, 40, and 52 weeks postpartum) of follow-up over a period of 12 months, the Perth Infant Feeding Study Mark II (PIFS II). This second study was undertaken in two local hospitals in Perth, Australia between 2002 and 2003. While the initial results of the PIFS II have been published elsewhere, variables related to the postpartum women's body image had not previously been analysed. Both studies used almost the same questions on infant feeding practices and about postpartum women's body image.

Univariate analysis was first employed to describe breastfeeding practices and to assess which factors could be included in the model of breastfeeding duration. These were then incorporated into multivariate analysis to identify the contributing factors

of the duration of 'any breastfeeding' to six months postpartum. In the second group of analysis, factors related to postpartum women's body image, their Body Mass Index (BMI) and perceptions of changes in their weight status, body and breast shape were included. These factors were then entered into a multivariate logistics regression analysis with other contributing factors in breastfeeding duration.

In the Japanese study, 2,345 women were eligible to participate and 1,623 completed the questionnaire (Response rate: 69.2%). For the final analysis, 1,612 questionnaires were used, due to missing data. The majority (72.8%) of respondents were housewives with mean age 32.2, ranging from 18 to 44. Almost half of them were primiparous (56%) and had annual family income below 4,500,000 Japanese yen (JP¥) (55.5%) (Equivalent value in Australian dollars (AU$), approximately 50000). Low birth weight infants (less than 2500g) were 8.4%, and the great majority of postpartum women (85.0%) had a vaginal delivery. The prevalence of smoking and alcohol during breastfeeding reported by the women were 10.6% and 14.1%, respectively. It was interesting to note that the first feed for 29.8% of the infants was infant formula, followed by glucose (19.5%). By two weeks of age, more than 85% of infants had been introduced to infant formula. Consequently, 'exclusive breastfeeding' was not common and 'any breastfeeding' was the most common infant feeding method in Japan, with mean duration of 9.1 months (Standard Deviation (SD) = 6.4). The Iowa Infant Feeding Attitudes Scales (IIFAS), reflecting knowledge and attitudes towards infant feeding practices, of the sample was 54.2 (SD = 4.9), a low score, compared with other studies. In this sample, other family members such as husbands and women's own mothers were less involved in decisions on infant feeding methods.

With regard to postpartum women's body image, 23.9% were in the 'underweight' category in their Body Mass Index (BMI) before the first pregnancy and this decreased to 17.8% at 18 months postpartum. The majority perceived some changes in their breast shape, namely 'lost tension', 'changes in size', and 'sagging'. While more than half believed that breastfeeding helped to regain their body shape faster than infant formula, the same proportion stated that breastfeeding also made their breast shape 'drooping'. The Attention to Body Shape Scale (ABS), a measure assessing one's body image, showed that the Japanese postpartum women were very

conscious of their body shape, but this was not a significant factor in relation to breastfeeding outcomes.

Results of stepwise logistic regression analysis found four factors that were negatively associated with the duration of 'any breastfeeding' to six months of postpartum specifically, working women in non-professional areas (adjusted Odds Ratio (OR) = 0.41, 95% Confidence Interval (CI) = 0.23 to 0.72), experienced in breastfeeding problems (adjusted OR = 0.34, 95% CI = 0.23 to 0.51), smoking by the women during breastfeeding (adjusted OR = 0.32, 95% CI = 0.15 to 0.66), and perceived changes in breast shape (adjusted OR = 0.60, 95% CI = 0.40 to 0.91). In contrast, four factors, the later introduction of infant formula (adjusted OR = 1.07, 95% CI = 1.03 to 1.11), primipara (adjusted OR = 2.26, 95% CI = 1.05 to 4.87), the decision on infant feeding methods before pregnancy (adjusted OR = 2.73, 95% CI = 1.79 to 4.18), alcohol intake during breastfeeding (adjusted OR = 2.00, 95% CI = 1.18 to 3.39) were significantly associated with continuing 'any breastfeeding' to six months postpartum.

In the Australian study, the Perth Infant Feeding Study Mark II (PIFS II), overall 870 of 1068 postpartum women who were eligible for the study were recruited and asked to complete the baseline questionnaire. In total, 587 completed questionnaire were received, a response rate of 68%. Approximately 30% of respondents were in their 30s, which was the highest proportion by age. The majority were Australian born (73.2%) and were multiparous (63.2%). Only 2.2% of infants were low birth weight and 70% had vaginal deliveries. The highest percentage of annual family income was at the group between 25,000 AU$ and 40,000 AU$ at 31.0%. The smoking rate reported by the women lies between 23% and 39% during the follow-up periods, and the prevalence of alcohol consumption by the women ranged from 40.2% to 48.5%. The majority had made a decision about infant feeding methods either before or early pregnancy (91.8%) and those infants were most often fed breastmilk as their first food while in hospitals (81.2%). Their husbands and own mothers positively supported breastfeeding in the decision making processes. The mean duration of 'any breastfeeding' and of introducing infant formula were 23.3 weeks (SD = 19.7) (approximately 5.8 months). The IIFAS also indicated that the Australian women showed positive attitudes towards breastfeeding with the mean score 64.4 (SD=8.3). About 8% of the Perth women were in the 'underweight' category (BMI < 18.5)

before pregnancy. 51% noticed changes in their breast shape within four weeks of birth and this increased to 60% at 52 weeks postpartum. The most common changes perceived between four and 52 weeks postpartum were 'sagging' following 'changes in size'. The factors that influenced breastfeeding duration in Australia were similar to the Japanese women with the exception of alcohol consumption. A multiple logistic regression showed that the women who had longer breastfeeding duration were more likely to perceive changes of their breast shape at week 52. For a one week increase in the duration of 'exclusive breastfeeding' up to six months, the average risk of perceived changes in breast shape at week 52 increased by 3.5% (95% CI = 1.00 to 1.07), by 3.8% (95% CI = 1.01 to 1.07) with 'any breastfeeding' duration up to six months, and by 2.9% (95% CI = 1.00 to 1.06) with 'full breastfeeding' up to six months, respectively. Moreover, the average risk of perceived changes in breast shape at week 52 increased by 0.8% (95% CI = 1.00 to 1.02), whenever women increase 'any breastfeeding' duration up to 12 months with each additional week.

Cox logistic regression was also used to explore breastfeeding by type for six months or 12 months given their perceptions of breast shape at four weeks postpartum. However, no significant associations were found after adjustment of the model. The results indicated that the Australian women perceived changes to their body weight and breast shape in the postpartum period, but Japanese women were significantly more conscious about these aspects than their Australian counterparts. The cultural backgrounds of the women affected the associations between body image and breastfeeding outcomes. It is important to acknowledge this factor when providing education programs in breastfeeding.

Breastfeeding outcomes were different between studies, particularly with regard to supplemental feeding, family involvement in decisions about infant feeding methods, and opinions on alcohol intake during breastfeeding. In addition, the prevalence of women with 'underweight' BMI is different between the two countries. These two studies suggest that cultural beliefs about women's body image were associated with breastfeeding duration. The Japanese women were more conscious about their body and breast shape, which was significantly associated with breastfeeding duration, compared with their Australian counterparts. Women's knowledge and attitudes towards breastfeeding reflected this and was at a lower level in Japan than in

Australia. Several issues including media exposure, social expectations about women's body shape and gestational weight control that are potentially related to women's body image are discussed below.

There are some limitations that needed to be considered when interpreting and assessing the applicability of the results. Through these two studies, changes of body weight, breast in shape were not assessed by any objective measure and were based on the participants' perceptions. In addition, as the first study was cross-sectional and based on self-reported data at 18 months postpartum in Japan, there is a possibility of some recall bias about breastfeeding practices. In the second study, the PIFS II, a limitation was that the sample was recruited from two public hospitals and probably reflected a selection bias towards lower socio-economic status.

It is recommended further studies using a cohort method with a large sample size and a qualitative approach be undertaken to enrich and verify the results of the study. These will enable a more accurate estimate of the prevalence of breastfeeding, factors that predict breastfeeding duration and postpartum women's perceptions of changes in breast shape during breastfeeding. Breastfeeding education programs should be based on accurate studies of maternal knowledge and attitudes towards infant feeding methods, benefits of breastfeeding in the short and long term, and attitudes to body image in postpartum. These education programs need to acknowledge cultural perspectives in breastfeeding and women's body image. Further improvements in working environments of postpartum women allowing them to continue breastfeeding are also suggested. It is important for public health that relevant interventions should be developed to improve breastfeeding rates and duration, in Australia and Japan.

Abbreviations

ABS	Attention to Body Shape Scale
AU$	Australian dollar
BF	Breastfeeding
BMI	Body Mass Index
BSQ-8c	Body Shape Questionnaire with 8 items in the short version
CI	Confidence Interval
HR	Hazard Risk
IIFAS	Iowa Infant Feeding Attitudes Scale
IQ	Intelligence Quotient
JP¥	Japanese yen
LBW	Low Birth Weight
OR	Odds Ratio
PIFS	Perth Infant Feeding Study
PIFS II	Perth Infant Feeding Study Mark II
RR	Relative Risk
SD	Standard Deviation
SPSS	Statistical Package of Social Sciences
US	United State of America
UK	United of Kingdom
UNICEF	United Nations Children Fund
WHO	World Health Organization

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Chapter 1: Introduction

This chapter provides a synopsis of the study. This includes the background of the study, study objectives, significance of the study, and the definitions of the terminology used in this study.

1.1 Background of the study

Breastfeeding provides a wide range of benefits for postpartum women and their infants. These protect infants against several acute and chronic diseases and also improve their physical, psychological, and cognitive status (Ip et al., 2007; Stuebe, 2009). The benefits that accrue from breastfeeding also contribute to postpartum women's health in encouraging the recovery process from childbirth, the cultivation of parenting possibly the prevention of several diseases in their later life (Godfrey & Lawrence, 2010). Most national and international health organisations have recommended 'exclusive breastfeeding', i.e. having breastmilk only, for the first six months, followed by appropriate complementary food and breastfeeding into at least the second years of life (American Academy of Pediatrics Work group on breastfeeding, 1997; National Health and Medical Research Council, 2003; World Health Organization, 2002). Due to the many promotion projects on the benefits of breastfeeding have been implemented by international agencies, the initiation rate of 'exclusive breastfeeding' has increased worldwide. However, there is still scope for improvement in the duration rate of 'exclusive breastfeeding' in most countries.

In Australia, the 2011 Australian National Infant Feeding Survey showed that the rate of 'exclusive breastfeeding' at six months of age was 15.4% (Australian Institute of Health and Welfare, 2011a), which is a decrease from 18.6% in the 1995 National Health Survey (NHS) (Donath & Amir, 2000c). Several studies reported that approximately five to eight precent of women stopped breastfeeding even prior to discharge from hospital (Fetherston, 1995; Scott, Landers, Hughes, & Binns, 2001). Clearly then, the reasons for the early discontinuation of breastfeeding in Australia still need further consideration.

In Japan, the National Survey of Infants' Growth, which has been carried out every decade since 1960, has shown an increase from 35.3% 'exclusive breastfeeding' at four-five months in 1990 to 35.9% in 2000 and to 55.8% in 2010, respectively (Minister of Health Labour and Walfare, 2011). However, as the WHO definitions of breastfeeding type were not used in these studies, it is difficult to interpret the results. There are other National Surveys on infant feeding but these also used ambiguous definitions of breastfeeding. Although the rate of 'exclusive breastfeeding' has increased over the last decade, the National goal for Japan has not yet been achieved (Ministry of Health Labour and Welfare, 2010a).

Many studies in different cultural settings have identified factors that are reported as being associated with breastfeeding outcomes including its intention, initiation, and duration (Haughton, Gregorio, & Pérez-Escamilla, 2010; Ladomenou, Kafatos, & Galanakis, 2007). These factors include demographic, medical, social, cultural, and psychological perspectives. Demographic, social, and medical factors are most commonly studied, but it can be very difficult to understand more personal, cultural, and psychological factors (Hector, King, Webb, & Heywood, 2005). For example, women's body images including their perceptions of changes in body or breast shape. The early literature suggested that breastfeeding outcomes would be susceptible to the influence of breast shape changes that women have perceived (Barnes, Stein, Smith, & Pollock, 1997; Foster, Slade, & Wilson, 1996; Scott & Binns, 1998). The number of women who are concerned about their figure changing due to breastfeeding has been increasing (Rinker, Veneracion, & Walsh, 2008, 2010). Some of them have struggled about their weight status or body shape after childbirth (Walker & Freeland-Graves, 1998).

In surveys, women tend to report only socially 'desirable', 'acceptable' or more 'child-focused' factors as reasons for ceasing breastfeeding and thus these factors rarely appear (McLennan, 2001). Some women are more conscious of their body and breast shape than others. In some cultural setting, women's body shape is given greater emphasis and their breasts are a symbol of adult sexuality (Miller, 2003). There is extensive literature on breastfeeding, but a review of the literature failed to identify any studies that have examined and analysed breastfeeding outcomes related to postpartum women's body image, despite some studies identifying this as an issue and recommending further studies (Amir & Cwikel, 2005; McLennan, 2001).

Hence, it is important to investigate associations between breastfeeding outcomes and postpartum women's body image including their perceptions of changes in body and breast shape. The two countries that will be studied, Australia and Japan, have distinctive cultures while having similar advanced health status. By comparing the results of breastfeeding studies in the two countries, it may be possible to obtain a better understanding of cultural issues relating breastfeeding and women's body image.

1.2 Objectives of the study

1.2.1 Overall objective

To investigate the factors affecting infant feeding practices in Japan and including a comparative analysis of relationships between breastfeeding outcomes and postpartum women's body image in Japan and Australia.

1.2.2 Specific objectives

a) To describe infant feeding practices in Japan
b) To identify factors that influence breastfeeding duration to six months postpartum in Japan
c) To study postpartum women' body image in Japan and Australia
d) To analyses relationships between breastfeeding outcomes and postpartum women's body image including their perceptions of changes in their breast shape in the context of the Japanese and Australian studies
e) To compare results between the Japanese and Australian studies in terms of ethnic and cultural viewpoints

1.3 Significance of the study

There are many published studies about the importance of breastfeeding and factors that influence intention, initiation and duration of breastfeeding. However, there are few reported studies focusing on women's body image including their perceptions of breast shape change in relation to breastfeeding outcomes. While this issue is described as a concern by postpartum women who participated in the Perth Infant

Feeding Studies (PIFS) in Australia before, there is a paucity of information to assist health professionals in assessing the importance of this relationship. Only a few studies have identified it as an important issue (Ahn, Sohn, & Yoo, 2010; Pisacane & Continisio, 2004; Rinker, et al., 2008). This thesis adds to the existing knowledge and will enable women and health professionals to gain a better understanding about breastfeeding outcomes with regard to changes in breast shape. This understanding will benefit women who will breastfeed their infants in the future. The findings of this study will also enable health professionals to develop and enhance teaching strategies to increase breastfeeding rates. This topic is important and this comparative study of breastfeeding factors in Japan and Australia may encourage further research into additional cultural factors and breastfeeding.

1.4 The definition of terms used in this study

- **Exclusive breastfeeding:** Women give only breastmilk to infants. It precludes the used of any other liquids or solids since delivery (Word Health Organization, 2007).

- **Predominant (Full) breastfeeding:** Women give breastmilk as the main nourishment for infants and are also allowed to give water, water-based drinks, fruit juice, and Oral Rehydration Solution (ORS). However, it precludes the used of formula and solids (Word Health Organization, 2007).

- **Any breastfeeding:** Women who give fully breastfeeding or those who give breastmilk and formula to infants with or without solids (Word Health Organization, 2007).

- **Complementary foods:** Any nutrient-containing foods or liquids (other than breastmilk/human milk) given to infants who are breastfeeding (Webb, Marks, Lund-Adams, Rutishauser, & Abraham, 2001, p. xi)

- **Breastfeeding initiation:** The infant's first intake of breastmilk (Webb, et al., 2001, p. xii)

- **Breastfeeding duration:** The total length of time an infant received any breastmilk at all from initiation through until weaning is complete (Webb, et al., 2001, p. xi)

- **Body image:** Any image of the human body, which may be of spatial existence, of motion that the body causes, or of visible shape and size, or of composition, either as a whole or as parts that constructs and alerts throughout lifetime (Kagawa, 2004, p. 8)

- **Body dissatisfaction:** A person's negative thoughts and feelings about his and her body (Grogan, 1999, p. 2)

1.5 Summary

Breastfeeding is a unique ability that only women have in order to provide optimum nutrition for their infants. However, breastfeeding has become an area that needs further research as rates have declined during the past century and there has been insufficient research on the importance of psychological/cultural factors in breastfeeding outcomes including intention, initiation, and duration. One area requiring more study is women's body image in relation to breastfeeding duration. Many women believe that breastfeeding is associated with changes of their breast shape. They also struggle with their body weight and return to pre-pregnancy shape after delivery. Returning to pre-pregnancy body shape, including breast shape is a major challenge for many women. Therefore, this study aims to identify associations between breastfeeding duration and the women's body image including perceived changes in their breast shape to facilitate a better understanding of breastfeeding within the Western Australian and Japanese context.

1.6 Outline of the thesis

This thesis is composed of six chapters. Chapter one provides the brief background of the current situation in breastfeeding and women's body image issues. The first

chapter includes a definition of technical terms, plus purpose, objectives, and the significance of the study.

Chapter two reviews the relevant literature on the topic of the study, encompassing both the past and the current situation. The factors that influence breastfeeding outcomes in Japan and Australia are also separately presented.

Chapter three describes the methodology used for the study, which includes the study design and location, study questionnaire used, recruitment of subjects, and the procedures for data collection and analysis. The ethical principles are also detailed.

Chapter four provides the detailed results from the data analysis. These findings are then discussed, compared, and contrasted in Chapter five to the existing literature including a summary of the underlying limitations.

Chapter six concludes the thesis by making recommendations arising from the study, and presenting the conclusion.

Additionally, information sheets, questionnaires and other relevant documents are given in the Appendices.

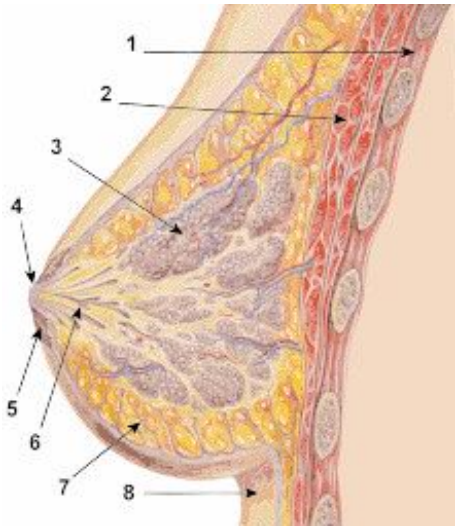
Chapter 2: A review of literature

This chapter provides an extensive literature related to the topic of the study. The anatomical and physiological perspectives of breastfeeding are described following the changes of breast shape throughout women's life. Women's body image with various perspectives including their perceptions towards breast shape changes related to breastfeeding outcomes was then reviewed. The advantages of breastfeeding, trends of infant feeding practices and factors that are associated with breastfeeding duration are also presented. Australian and Japanese situations are described separately in some sections.

2.1 The anatomical position and composition of the breast

The breast, which is developed from the ectoderm and is derived from sudoriferous glands, is anatomically situated between the second and sixth ribs with the area from sternum to the anterior border of the axilla (Applegate, 2010). It also sits over the pectoralis major, serratus anterior and external oblique muscles (Gould, 1983; Lawrence & Lawrence, 1999). The composition of the breast includes skin, nipple, areola, adipose tissues, and mammary glands. Adipose tissues and mammary glands are approximately in a volume ratio of one to two with women who are breastfeeding and one-to-one in non-breastfeeding and 65% of the mammary glands present within 30 mm from the basilar papilla (Ramsay, Kent, Hartmann, & Hartmann, 2005). Mammary glands are composed of 15-20 lobes that are a cluster of several lobules; the lobules are also composed of alveoli, which secrete breastmilk. The breast is also connected to a layer of deep fascia and suspensory ligaments known as Cooper's ligaments (Applegate, 2010). Cooper's ligaments are different from the usual ligaments which support the bones like limbs, these are elasticised but loose connective tissues that vertically attach through adipose tissues to the skin, and only support the breast. Hence, the breast is movable (Applegate, 2010). Moreover, the nipple and areolae have no adipose tissues, but have smooth muscle fibres. The nipples are located in the central part of the each breast, stand erect by reacting to stimuli, and are surrounded by the areola, which has a darkened colour and rounded in shapes (Gould, 1983; Lawrence & Lawrence, 1999). The nipple clinically has five

to ten openings from lactiferous ducts and secretes breastmilk during the lactation period although, the ducts used to be said to have from 15 to 20 openings which are connected to each nipple (Ramsay, et al., 2005). The areolae have many small nodules which secrete an oily substance similar to breastmilk in order to keep the skin softer and smoother (Moore & Dalley, 2010). Figure 1 is shown the picture of inside of the human breast.



1. Chest wall
2. Pectoralis muscles
3. Lobules
4. Nipple
5. Areola
6. Duct
7. Fatty tissue
8. Skin

Figure 1: The anatomy of the breast (side view)

2.2 Physiology of breastfeeding

2.2.1 Lactogenesis

There are three stages of lactogenesis, which are referred to as the periods for breastmilk synthesis and secretion occurring from pregnancy throughout early postpartum (Lawrence & Lawrence, 2005). While mammary glands include numerous alveoli present at birth, these glands start developing during puberty and adolescence. Further developments occur during pregnancy under the control of several hormones.

'Lactogenesis I' occurs from the middle term of pregnancy to two days postpartum; this stage is defined as the stage for alveoli to start secreting breastmilk (Hurst, 2007). With the development of alveoli, breast size increases in most women. In fact, alveoli often secrete breastmilk, which is called colostrum after week 16 of pregnancy through to delivery, even if a foetus is unable to survive (Lawrence & Lawrence, 2005). However, mammary glands are hormonally still inactive. By a

rapid decrease of serum progesterone and a rapid increase in lactose levels just after delivery copious milk production is commenced, called "lactogenesis II" (Hartman, 2007; Neville, Morton, & Umemura, 2001).

'Lactogenesis II' usually begins 32 to 96 hours (day three to eight) postpartum (Walker, 2011b). Breastmilk, which secreted for the first a few days in postpartum (approximately from zero to four days), is still called colostrum followed by transitional milk and more mature breastmilk that secretes several weeks later (from 15 to 30 days) (Butte, Lopez-Alarcon, & Garza, 2002). While colostrum contains high levels of sodium, chloride, and proteins (immunoglobulin, lysozyme, and lactoferrin), it has low levels of casein, lactose, potassium, citrate, calcium, and phosphate. Breastmilk in Lactogenesis II has a high level of casein, lactose, potassium, citrate, calcium, and phosphate, but decreased levels in sodium, chloride, and protein (Kent, 2007; Neville, et al., 2001).

The onset of 'Lactogenesis III' occurs approximately nine days after delivery, this stage, previously known as galactopoiesis, keeps milk production constant (Lawrence & Lawrence, 2005). Findings from several studies stated that productive amounts of breastmilk was related to a removal of breastmilk by infants or expressing (Hartman, 2007; Hartman, Sherriff, & Kent, 1995). This 'supply-demand response' of production in breastmilk is influenced by autocrine control (Lawrence & Lawrence, 2005).

2.2.2 Endocrine and autocrine control

Milk production in the breast during lactogenesis is controlled by several hormones, the endocrine and autocrine control. While endocrine control is engaged in the establishment of lactation, focusing on controlling the whole system in the body during 'lactogenesis II', autocrine control is more involved in managing milk volume with local control in 'lactogenesis III'.

Prolactin, which is an essential hormone for initiation of lactation, gradually increases its levels by 20-30 times throughout pregnancy (lactogenesis I), compared to non-pregnancy (Riorden, 2010). However, lactation still does not initiate in this stage due to high levels of placental oestrogen and progesterone, which are prolactin

release-inhibitory factors (Leung, 2005). Oestrogen and progesterone levels drop abruptly with the delivery of the baby and placenta (The onset of lactogenesis II).

After the reduction of these hormonal levels, prolactin is released from the anterior pituitary gland, which starts milk production in the alveoli. However, in order to establish of lactation, constant release of prolactin is essential to generate nipple stimulation by infant's suckling, as prolactin decreases gradually after childbirth if there is no stimulation (Moulden, 1994). In response to the suckling by infant or other stimuli (e.g. hearing the baby cry, thinking about the baby and/or smelling the odour of the baby), oxytocin is released from the posterior pituitary gland and coordinates the function of the 'milk ejection reflex' or 'milk let down' for emitting the breastmilk from alveoli into the duct (Walshaw, 2010).

Once lactation is established, short-term milk synthesis is operated by autocrine control, which is based on the relationship between the infant's appetite and the emptiness of the breast (National Health and Medical Research Council, 2003). If residual breastmilk remains, a specific protein inhibits the secretion of breastmilk. Therefore, the more breasts are emptied, the more the breastmilk is produced by the next feeding (Walshaw, 2010). Ramsay et al. (2004) demonstrated this by using ultrasound imaging to show how the frequency of milk ejection was related to the number of infant sucking and milk intake.

2.3 Biochemistry of nutrition in breastfeeding

Mature breastmilk is composed of water, fat, protein, vitamins, minerals, growth factors, hormones, enzymes, and immune-protective factors (Henderson & Scobbie, 2006; Jensen, 1999). Although some components of breastmilk vary from the stage of lactogenesis, maturity, and infants' environment/age in months, these changes are congruent with infants' nutritional needs as they grow older (World Health Organization, 2000). The lactation stages correspond to the following times postpartum: 1) colostrum (0-4 days after birth), 2) transitional milk, and 3) mature milk (15-30 days after birth) (Butte, et al., 2002). Infants need to protect themselves from various bacteria in the early days after birth, for they do not have sufficient immunity levels. Colostrum contains substances that help to bolster immunity and

nutrition so that there are larger amounts of antibodies, Vitamin A and B_{12}, protein, lactose, and other nutrients, but less fat. Mature breastmilk is characterised by a higher concentration of fat and energy than colostrum because these are essential components for children's development at this age (Butte, et al., 2002; Marangoni et al., 2000).

Breastmilk at the first year contains the required amounts of energy, vitamin A, vitamin D and vitamin B_6 at stable levels of 0.67kcal/g, 1.7µmol/L, 645ng/L and 0.13mg/L, respectively (Butte, et al., 2002). In the second year of life, it contains approximately 31% of the energy, 38% of the protein, 45% of the vitamin A, and 95% of the vitamin C that children in this age need (WHO/UNICEF, 1993). Although breastmilk is able to provide the best-balanced nutrition for infants of any age, mature breastmilk has a low content of iron. The iron level in breastmilk is about 0.2-0.4mg/L however, its bioavailability is much higher than infant formula, which has approximately 50% iron absorption (Faldella, Corvaglia, Lanari, & Salvioli, 2003). Due to the high bioavailability of iron, infants are able to obtain the required amount of iron at least for the first six months of age, even if they are exclusively breastfed (Faldella, et al., 2003; Griffin & Abrams, 2001).

The components of breastmilk for premature infants are also appropriate for mature infants. Premature infants require more energy, protein, and fat, antibodies than mature infants for their survival, and breastmilk for them provides these essential substances. For example, concentration of protein, polyunsaturated fatty acid, and energy are higher in breastmilk for premature infants than for mature infants. These differences in milk components continue for one to two months in protein and for three months in polyunsaturated fatty acid, which give premature infants an advantage in their growth (Itabashi, Miura, Okuyama, Takeuchi, & Kitazawa, 1999). Moreover, breastmilk for preterm infants whose digestive systems are immature are easy to digest and absorb due to smaller molecules in the fat (Yang & Kuo, 2007). The differences in components among colostrum, mature breastmilk and formula in premature and mature delivery are shown in Table 1.

While breastmilk produces adequate nutrition regardless of maternal nutritional status, environment, and climate, the composition of fats, vitamins and minerals may vary with maternal intake. There is no substitute available for the unique

components and nutrients in breastmilk. In order to promote breastfeeding practice, it is important to understand the differences among breastmilk, formula, and animal milk, which are the reasons why breastmilk is the most recommendable food for all babies with any circumstances in terms of affecting digestive, absorbable and immune system.

Table 1: Different milk composition among colostrum, mature breastmilk and infant formula per 100ml

	Term delivery (3-5days)	Premature delivery (3-5days)	Term delivery (26-29days)	Premature delivery (26-29days)	Infant formula
Energy (kcal)	40	50	62	70	67-70
Fat (g)	1.85	3	3.05	4.09	3.5
Protein(g)	1.87	2.1	1.29	1.4	1.6-1.64
Lactose (g)	5.14	5.04	6.51	5.97	7.1-8.1

(Source: (Anderson, 1985)

2.4 The changes in breast shape throughout a women's life

A woman's breast alters in shape due to the change of the volume ratio between adipose tissues and mammary glands as they develop, ramify, and atrophy throughout their lifetime. Changes occur during puberty and pregnancy, and also at times of rapid weight change (Geddes, 2007; Rinker, et al., 2010). The breast usually has a conic shape at the adulthood, although the position, volume, size, shape, and density of breast greatly rely on heredity, ethnicity, dietary factors, the change of hormonal levels, and body fat composition (Lawrence & Lawrence, 2005; Moore & Dalley, 2010; Scheurnhammer et al., 2007).

2.4.1 A period from prenatal to puberty

Two parallel primitive forms of milk line are observed from the axilla to the groin by the fourth week of gestation and the mammary gland starts growing from the fifth week of gestation (Lawrence & Lawrence, 2005; Riorden, 2010). Two bilateral parts persist to form in the pectoral area, which become the breasts later (Seltzer, 1994). About 15 to 25 primary milk ducts appear, which are solid and branching chords by 15 weeks of gestation and further develop for canalization by 32 weeks of gestation

(Riorden, 2010). Lobular-alveolar structures expand between 32 and 40 weeks of gestation (Lawrence & Lawrence, 2005; Riorden, 2010). It is also often observed that neonates may secrete small amount of colostrum, referred to as witch's milk because the secretion of milk is affected by hormones from mothers (Lawrence & Lawrence, 2005; Riorden, 2010). While the breast in males and females are similar until early childhood, changes in the female breast begin from the puberty period. During the puberty period, the women's breast alters size and shape due to not only the mammary glands and ductile systems developing a lengthening and branching pattern, but also the adipose and fibrous tissue increasing. As a result, the breast starts to take a hemisphere shape. The enlargement and pigmentation of areola and nipples also occurs. The terminal ducts and the lobules are formed at the end of puberty, but before commencing menstruating (Lawrence & Lawrence, 2005). Although there are several hormones involved in forming the breast, the principal hormone related to this growth is oestrogen, a sex hormone (Seltzer, 1994). The menstrual cycle also affects the change in the breast, which is addressed as an increase in size, in density, and in tenderness (Page & Steele, 1999). During the follicular phase, the lobules size are small and there are few inactive alveoli in cell division, while these become larger and are active during the luteal phase (Walker, 2011b). Most women feel an increase in breast size during the follicular phase, which is before the commencement of menstruation every month (Walker, 2011b). However, the cell division lessens at around 35 years of age (Walker, 2011b).

2.4.2 A period from pregnancy to postpartum

With the onset of pregnancy, the breast starts changing colour, volume, shape, and size for most women (Lawrence & Lawrence, 2005). The mammary glands develop due to the influence of several hormones including prolactin. Pregnant women often describe their breasts as getting larger and firmer at the end of pregnancy compared to their non-pregnancy (Komori, 1993). Breast size is determined by the amount of adipose tissues and it is maximised during lactation period (Komori, 1993). A brassiere size by measuring of breast is a way for an indication of the breast size in most countries however, there is no universal standard for this measurements (Greenbaum, Heslop, Morris, & Dunn, 2003; Zheng, Yu, & Fan, 2007). The labelling of breast size consists of two elements: a band size and a cup size (Greenbaum, et al., 2003; McGhee & Steele, 2006). Band size indicates an under-

bust measurement, which is the thoracic circumference just below breast by showing a number (Greenbaum, et al., 2003; Wood, Cameron, & Fitzgerald, 2008). Cup size is described as breast volume and is based on the calculation of the gap between a band measurement and an over-bust measurement, which is the girth across the most prominent part of the breast by showing alphabetic letters (Greenbaum, et al., 2003; McGhee & Steele, 2006; Zheng, et al., 2007). This gap is calculated by the over-bust measurement minus the under-bust measurement.

In Australia, breast size refers to the dress sizing charts, which is a totally different system from other countries including the United Kingdom, the United States, Italy, and Japan (Findikcioglu, Findikcioglu, Ozmen, & Guclu, 2007). Australia adopted a European clothing size standard, EN 13402, which was introduced by European Union in 2006. However, Australian sizes are confusing as some use inch and some use centimetres. The Australian band sizes range from eight to 22, approximately equal to dress size and the classification of cup size ranges from AA (smallest size) to J (largest size) (Wood, et al., 2008). The display of the brassiere size in Australia follows band size first and cup size. For instance, the size of brassiere, 10 B means 68-72 centimetres band size and a B cup breast volume. The following tables (Table 2 and 3) show the relationship between cup size of brassiere and the gap.

Table 2: The brassier size and the range of band size in Australia

Brassier size	8	10	12	14	16	18	20
Range of band size (cm)	63-67	68-72	73-77	78-82	83-88	88-92	93-98

(Source: EN 13402, 1998, (Wood, et al., 2008)

Table 3: The sizing of brassier for Australian women

Cup Size	AA	A	B	C	D	DD	E	F	FF	G	GG
Over-bust girth minus under-bust girth (inch)	0.5-1	1-1.5	1.5-2.5	3-4	4	5	6	7	8	9	10
(cm)	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22

(Source: EN 13402, 1998, (Wood, et al., 2008)

In Japan, the breast size is stipulated in the Japanese Industrial Standards (JIS) which is the national standard of sizing used in any manufacturing area (Japanese Industrial Standards Commitee, 1998). According to the JIS, the size of brassiere in Japan is

based on the band size, while the display size is different from Australia: cup size and band size. For instance, C 70 indicates that cup size is C and band size ranges from 67.5 to 72.5 centimetres. The sizing charts for women's brassiere in Japan are following (see Table 4 and 5).

Table 4: The brassier size and the range of band size in Japan

Brassier size	65	70	75	80	85	90	95
Range of band size (cm)	62.5-67.5	67.5-72.5	72.5-77.5	77.5-82.5	82.5-87.5	87.5-92.5	92.5-107.5

(Source: (Japanese Industrial Standards Commitee, 1998)

Table 5: The sizing of brassier for Japanese women

Cup Size	AA	A	B	C	D	E	F	G
Over-bust girth minus under-bust girth (cm)	7.5	10	12.5	15	17.5	20	22.5	25

(Source: (Japanese Industrial Standards Commitee, 1998)

A Japanese study found that the breast cup volume of pregnant women increased by two-thirds of a cup between weeks four and 11 of pregnancy when the breast volumes of non-pregnant women are assumed to be zero (Komori, 1993). The breast volume increased beyond one and half cup sizes by week 19 of pregnancy. The breast volume grew two cup sizes by week 27 of pregnancy, and a half cup size enlargement then occurred through to the delivery. The breast volume reached its peak at two to three days after the delivery and this lasted for approximately 20 days (Komori, 1993). Thereafter, the breast gradually reduced its volume and firmness. Mammary glands rapidly return to their pre-pubertal state when the regular stimuli of sucking from infants ceases, although the breastmilk remains in the alveoli within a few days (Gould, 1983). By four weeks after delivery, the breast volume returned to the same under-bust measurement as week 22 of pregnancy (Komori, 1993). While this great change in breast size occurred by week 22 of pregnancy, some women's breast size increase in the last trimester of the pregnancy or postpartum period (Geddes, 2007). The change of breast cup volume of pregnant women in Australia varies for different individuals and the volume of each breast increases approximately 145 ± 19ml (range, 12-227ml) during pregnancy, and approximately an additional 211 ± 16ml (range, 129-320ml) by one months after the delivery (Geddes, 2007). Another Australian study found that the women's breast reduced in

volume with an average of 190.3 ± 13.1ml for the first six months after delivery, 95.8 ± 19.8ml at nine months, 78.8 ± 15.6ml at 12 months, and returned to almost the same breast volume as the pre-pregnancy status at 15 months after delivery (Kent, Mitoulas, Cox, Owens, & Hartmann, 1999). The weight of the each breast is approximately 200g if not pregnant, 400-600g around the expected date, and 600-800g in the lactating period, respectively (Lawrence & Lawrence, 2005). There are various types of breast including nipple in terms of its shape, size, or volume. However, WHO have addressed that infants are able to suck any types of breast (World Health Organization & UNICEF, 1993).

2.4.3 A period from menopause to senescent

There are a few studies focusing on breast volume, shape, or size in this period. The breast gradually reduces in volume and size with the change of not only the oestrogen level but also the volume ratio between the stroma and parenchyma (Gould, 1983; Wren, 1996). The stroma increase to parenchyma thus the breast after the menopause period becomes softer than before (WACORL, 2010). The mammary glands and ducts reduce in size, consequently the breast volume becomes smaller (den Tonkelaar, Peeters, & van Noord, 2004). However, some women increase their breast size. Approximately one in five of postmenopausal women in the Netherlands (n = 1,130) increased their breast size and this tendency was significantly related to a weight gain of more than 3.5kg per five years in the past (OR = 2.61, 95% CI = 1.34-5.01) (den Tonkelaar, et al., 2004). Women undertaking hormone replacement therapy tend to gain weight thus, increasing their breast size. However, it was interesting to note in this study that women who gained weight of less than 3.5 kg still increased in breast size (den Tonkelaar, et al., 2004). Rinker, Veneracion, and Walsh (2010) found that for women who lost weight of more than 50 pounds in the past, this also became a factor related to the breast ptosis (p = 0.01) (Rinker, et al., 2010). A cohort study from adolescence to the menopause period, which was conducted by the Wacoal Corporation, an underwear manufacturer with the top market share in Japan, found that the averages of the band measurement and over-bust measurement of the women also increased with age (WACORL, 2010). According to their study, there are three steps of change in breast shape, and this change begins from the early 20s for some women (WACORL, 2010). The first step of the change in breast shape is to lose the volume within the upper part of the breast,

with a sag downwards as the second step, and then the breast tissues go on the outer side as the final step (WACORL, 2010). The breast skin becomes thinner particularly for the superior and medial parts of the breast, after the menopause period (Ulger, Erdogan, Kumanlioglu, & Unur, 2003).

2.5 Women's body image

2.5.1 Women's body image during postpartum periods

Women are aware of their changing body shape with various feelings during pregnancy and the postpartum periods. Women's body image changes with these periods. While there are several studies that have investigated body image, body dissatisfaction, and/or weight concerns, many of these studies focus on pregnant women and those who are younger or have eating disorders (Harris, 2010; Micali, Treasure, & Simonoff, 2007; Rocco et al., 2005; Wiseman, 2005). Less attention is paid to the body image of healthy women in the postpartum period, which means researchers are far from understanding the study topic (Clark, Skouteris, Wertheim, Paxton, & Milgrom, 2009).

An Australian cohort study of 116 pregnant women investigated their body dissatisfaction and depression levels throughout pregnancy to 12 month postpartum found that they were most likely to have negative feelings about body weight and shape at six months postpartum (Clark, et al., 2009). One of the highlights of this study was that the women's body image including their feelings of fatter and perceptions of changes in weight and body shape was worse in all postpartum periods (six weeks, six months, and 12 months postpartum) than throughout their pregnancy (17-21 weeks gestation and 32-35 weeks gestation) (Clark, et al., 2009). Postpartum women's body image is strongly related to body image in their pregnancy or in their pre-pregnancy. While the women's body image changes over the course of pregnancy, women are most dissatisfied about their body in the early to mid-second trimester (Skouteris, Carr, Wertheim, Paxton, & Duncombe, 2005). In contrast, postpartum women's body image increased at the later months rather than in the immediate months after delivery. A longitudinal study of 506 American women from delivery to nine months postpartum periods examined relationships

between body dissatisfaction and their characteristics (Gjerdingen et al., 2009). The results showed that women's body dissatisfaction became greater at nine months postpartum, compared to 0-1 month postpartum ($p < 0.001$). While women's body image is the lowest in the postpartum period, several early studies have reported that negative body image has often arisen in women before and throughout, childbirth (Lederman, 1984; Mercer, 1981; Strang & Sullivan, 1985). Some women try to control their weight during pregnancy. Dipietro et al. (2003) undertook a cross-sectional study of 130 healthy pregnant women at 36 weeks gestation to examine their attitudes and behaviours in relation to gestational weight gain in the United Status. This study reported that 21% (n = 27) of them performed at least one action to control their weight during pregnancy (Dipietro, et al., 2003). For instance, those women skipped meals before visiting an obstetrician and deemed themselves not to be pregnant early in their gestation. The women who restricted their weight gain more were highly correlated with anxiety ($r = 0.24$, $p < 0.01$), depression ($r = 0.029$, $p < 0.001$), anger ($r = 0.29$, $p < 0.001$), stress ($r = 0.23$, $p < 0.01$), and less uplifting ($r = 0.21$, $p < 0.05$) about their pregnancies. The women who had positive attitudes about their body image were less likely to be angry and depressed (Dipietro, et al., 2003). In this study, 14% (n = 18) did not gain sufficient weight (Dipietro, et al., 2003).

2.5.2 Postpartum women's body image and breastfeeding outcomes

An English study was undertaken of how women's concerns about their body shape and weight changes contributed to the intention of breastfeeding (n = 12,000) (Barnes, et al., 1997). The women who had concerns over their body shape changes were more likely to intend breastfeeding at one week postpartum (OR = 1.25, 95% CI = 1.09-1.42) and four months postpartum (OR = 1.26, 95% CI = 1.13-1.42), compared with those who had some concerns (Barnes, et al., 1997). Having a weight concern was not significantly associated with the intention of breastfeeding at one week postpartum, but was significant at four months postpartum (OR = 1.16, 95% CI = 1.02-1.32). The findings of this study demonstrated that women's self-image towards their body shape could be a factor that influences breastfeeding outcomes.

Similarly, Gjerdingen et al. (2009) found in their study as mentioned above, that the women with high level of dissatisfaction towards their own body shape in the early

months postpartum were 2.05 times less likely to be breastfeeding their infants at nine months ($p < 0.009$). Women's body image during pregnancy is also known to affect decisions on infant feeding methods. In Taiwan, a study of 195 women at 28 weeks gestation explored relationships among their body image, maternal-foetal attachment, and infant feeding methods (Huang, Wang, & Chen, 2004). The results of this study showed that women with poor self-image of their body are difficult to dedicate themselves to their foetus, even though they became pregnant. Consequently, women who had a negative body image during pregnancy tended to choose bottle feeding as it was harder for them to establish maternal-foetal attachment (Huang, et al., 2004). From an American study of 52 pregnant women with low income status studying how their awareness of body shape and sexuality affected their infant feeding practice, Johnston-Robledo and Fred (2008) found that pregnant women with a high awareness of body shape tended to be more anxious about the negative effects of breastfeeding ($r = 0.56$, $p < 0.01$), compared to those with a low awareness of body shape. Women's body image during pregnancy is an important predictor for occurrence of postpartum depression which is also affected to the intention, initiation, and duration of breastfeeding (Clark, et al., 2009; Downs, DiNallo, & Kirner, 2008; Rallis, Skouteris, Wertheim, & Paxton, 2007).

In addition, previous studies in several cultures showed that many women are concerned about their changing breast shape due to breastfeeding.

Utaka et al. (2005) compared breastfeeding attitudes between Japanese postpartum women living in Perth and Australian postpartum women. In their study, postpartum women in Japan were more likely to assume that 'breast sagging' had arisen from breastfeeding than in Australia (48% vs.19%) (Utaka, et al., 2005). They believed that the longer they breastfed the more their breasts would become sagging. This is possibly related to a Japanese word, 'Tarachine'. As the written letters of this word shows sagging breast, Japanese women presume that giving breastmilk to infants become a tacit understanding in terms of breast shape changes. In Korea, a cross-sectional study focusing on 2,235 postpartum women showed that the women who experienced breastfeeding gave the highest score for change of breast shape, compared with the women who had no experience of breastfeeding ($F = 22.162$, $p = 0.000$) (Ahn, et al., 2010). Although the women were happy for having given breastmilk to their infants, for many of them the perceived changes of breast shape

due to breastfeeding made it more difficult for them to continue breastfeeding (Ahn, et al., 2010).

A retrospective study with a sample of 496 Italian women at 18 months postpartum found that approximately 73% of them noted changes of their breast shape, compared with their pre-pregnancy shape (Pisacane & Continisio, 2004). The most common change was 'loss of firmness', including breast sagging by 33% following 'enlargement' which meant at least a one size increase in their bra cup size from before pregnancy by 27% (Pisacane & Continisio, 2004). The most important finding of this study was that these descriptions of breast shape changes had a similar prevalence between women with breastfeeding and without breastfeeding, 75% and 69% respectively, (Relative Risk (RR) = 1.09, 95% CI = 0.96-1.23) (Pisacane & Continisio, 2004). An American retrospective study at a plastic surgery office found that 51 of 93 women (53%) who had an experience of breastfeeding felt the change of breast shape since pregnancy (Rinker, et al., 2008). It was interesting to note that breastfeeding duration was not statistically correlated with breast ptosis in this study (OR = 0.94, 95% CI = 1.08-1.60, p = 0.49) (Rinker, et al., 2008). Rather, the higher age, smoking status of mothers, greater bra size, pregnant numbers, more than 50 pounds weight loss in the past and larger Body Mass Index (BMI) are more related to the change of breast shape (Rinker, et al., 2008). Although the sample of this study was not randomised and the results were then difficult to make generalisations about, many women's belief that breastfeeding affects the change of breast shape was statistically supported.

While there are cultural differences in opinions about the 'ideal' breast shape for women, some may not commence and continue breastfeeding out of concern for its effects. A survey studying reasons for discontinuation of breastfeeding among 220 postpartum women in the Dominican Republic found that they were prone to show themselves to be 'a good mother' (McLennan, 2001). For example, while they used 'baby does not want to milk' as a personal reason for discontinuation of breastfeeding, this reason was often converted to 'insufficient milk production' when general reasons were given. McLennan (2001) concluded that the women were more likely to report socially 'desirable' or more 'child-focused' reasons for discontinuation of breastfeeding in surveys. While many women felt their breast shape changes, these changes are based on the women's perceptions, called a 'fear of

loss of breast shape' (McLennan, 2001, p. 365). Women who are even not pregnant are also concerned about their breast shape with aging, and its effect on their sense of fashion, attractiveness and culture (Koff & Benavage, 1998; Leff, Gefferis, & Gagne, 1994).

2.5.3 Women's body image in relation to age or ethnic differences

Body image is also different between age groups or ethnicities (Carter-Edwards et al., 2010; Frederick, Forbes, Grigorian, & Jarcho, 2007; Grabe & Hyde, 2006). Several studies found that the younger women have a stronger body image than the older counterparts.

A cross-sectional study of 275 undergraduate female students in the United States found that they were concerned about three aspects of breastfeeding: embarrassment, body impact, and sexuality impact (Johnston-Robledo, Wares, Fricker, & Pasek, 2007). While only 29% planned to exclusively breastfeed their infants, over half (51%) decided not to undertake 'any breastfeeding' before pregnancy (Johnston-Robledo, et al., 2007). The implication of this result is that young women who are very conscious about their breast shape may more readily introduce bottle feeding at an early stage. The continuation of breastfeeding for those women with strong perceptions about their body image is thus important and a significant factor in breastfeeding patterns.

Ethnicity also affects women's body image but this topic is little attention in research areas (Swami et al., 2010). A meta-analysis of 98 studies on women's body image with ethnicity showed that the Caucasian were more dissatisfied about their body shape than the Black American ($d = 0.29$), but small differences were observed between the Caucasian and the Hispanic ($d = 0.09$), and between the Caucasian and the Asian American ($d = 0.01$) (Grabe & Hyde, 2006). However, the sample of the articles reviewed in this meta-analysis focused only woman in the United States (US) (Grabe & Hyde, 2006). The women might adapt themselves to the American culture, apart from their original culture. A study by Kagawa documented that the Japanese women desired to lose their weight than the Japanese men ($n = 139$ for women, $n = 84$ for men). Smith and Jonir (2008) reported that the ideal body shape amongst Japanese women were thinner, compared with the one amongst American women.

Japanese women presumed that Japanese men preferred thinner women (Smith & Joiner, 2008).

2.5.4 Husbands'/partners' attitudes towards breastfeeding

A study conducted by Scott et al. (2001) analysed factors that influenced the initiation and duration of breastfeeding on 1,618 Australian postpartum women. Their results suggested that if women's husbands/partners had negative or equivocal views on breastfeeding, women were more prone to discontinue breastfeeding, compared with women whose partners showed supportive views towards breastfeeding (OR = 9.13, 95% CI = 4.83-17.26). In rural Vietnam, women's spouses were significantly involved in women's decisions on infant feeding methods ($p < 0.01$), while approximately 80% ($n = 463$) decided the method of infants feeding by themselves (Duong, Binns, & Lee, 2004). A longitudinal study in Scotland compared couples' preferences towards two infant feeding methods: bottle feeding and breastfeeding (Shepherd, Power, & Carter, 2000). This study confirmed that women's husbands/partners who supported bottle feeding for their infants were less knowledgeable of breastfeeding benefits than the women ($p < 0.01$) (Shepherd, et al., 2000). Their husbands/partners who believed that bottle feeding made women more convenient, free and able to provide as much contentment to their infants as breastfeeding. Likewise, in an American study, Freed et al. (2002) reported women's husbands/partners who preferred women to bottle-feed their infants assumed that breastfeeding made women's breasts sag and was uncomfortable for women. These studies suggested that part of the challenge for women in dealing with breast shape changes is to identify the behavioural cues in their husbands'/partners' attitudes and knowledge to breastfeeding.

2.6 The advantages of breastfeeding

There are several viewpoints to describe the advantages of breastfeeding. In this thesis, these advantages are documented to postpartum women (mothers), infants, and society.

2.6.1 Advantages to postpartum women

2.6.1.1 Recovery from childbirth

Early initiation of breastfeeding helps mothers to recover from childbirth because the stimulation by infants' suckling at the nipple induces the release of oxytocins, which promote the contraction of the uterus, expel the placenta, and reduce postpartum bleeding (León-Cava, Lutter, Joy, & Martin, 2002).

Breastfeeding also accelerates mother's weight or fat loss and helps mothers regain their pre-pregnancy weight (Baghurst et al., 2007). A cohort study in Denmark found that women who continued breastfeeding for six months had the most significant effect for the reduction of their weight in their postpartum ($n = 36{,}030$; $p < 0.0001$) (Baker et al., 2008). The duration of breastfeeding for 18 months also had a considerable effect on weight loss ($n = 26{,}846$; $p < 0.05$) (Baker, et al., 2008).

While breastfeeding is not a reliable method for contraception (lactational amenorrhoea), it does reduce the risk of short birth intervals and thereby maintain maternal health (León-Cava, et al., 2002). The mechanism of lactational amenorrhoea is that increases prolactin and inhibits, gonadotropin-releasing hormone, levels by breastfeeding suppresses the restart of ovulation. The interaction between these two hormones prevents the resumption of the normal pre-ovulatory surge in luteinising hormone and inhibits ovulation (Hauck, Hall, & Jones, 2007). By continuing exclusive breastfeeding (lactational amenorrhoea method), there is an only one to two percentage probability of mothers becoming pregnancy again within six months of delivery (Labbok et al., 1997).

2.6.1.2 Prevention of several cancers

The Collaborative Group on Hormonal Factors in Breast Cancer (2002) epidemiologically studied the correlation between breastfeeding duration and incidence of breast cancer using a case-control technique in 30 countries (Case = 50,302; Control = 96,973). In this study, the risk of breast cancer could be reduced if women continued breastfeeding for 12 months (Relative Risk (RR) = 4.3, 95% CI = 2.9-5.8, $p < 0.0001$) and for each birth (RR= 7.0, 95% CI = 5-9, $p < 0.0001$) (Collaborative Group on Hormonal Factors in Breast Cancer, 2002). Longer durations of breastfeeding evidently demonstrated the prevention of breast cancer

worldwide. The result from a longitudinal study in the United States (n = 60,075) showed an even stronger association between breastfeeding and premenopausal breast cancer (Stuebe, 2009). Stuebe (2009) found that women who had never experience of breastfeeding had a 2.4 times increase (95% CI = 1.3-4.5) of premenopausal breast cancer with a first-degree relative than those who experienced breastfeeding. While several studies also found similar results of this association, a systematic review on long-term cohort studies concluded that breastfeeding was not associated with the incidence of breast cancer (Martin, Gunnell, Owen, & Smith, 2005).

The risk of ovarian cancer is decreased by breastfeeding. A Chinese case-control study (Cases = 275 with histologically confirmed epithelial ovarian cancer; Controls = 623 without neoplasm) reported that women with breastfeeding experience for 12 months or longer were at lower risk of ovarian cancer, compared with those with no more than four months (adjusted OR = 0.51, 95% CI = 0.3-0.9) (Zhang, Xie, Lee, & Binns, 2004). Binns (2004) showed that women who have experienced breastfeeding with at least three children were less prone to suffer from ovarian cancer than women with one experience of breastfeeding (adjusted OR = 0.44, 95% CI = 0.2-0.9).

There are several studies, which investigated the relationship between breastfeeding status and endometrial cancer. Newcomb and Trentham-Dietz (2000) analysed data within a case-control study in the United States (Cases = 586; Controls = 1653). Parous women who had breastfed for at least two weeks had a 10% lower risk of endometrial cancer than those who had not breastfed (RR = 0.90, 95% CI = 0.72-1.13). This study also explained about reduced risks that were of 42% among women with breastfeeding within recent three decades (RR = 0.58, 95% CI = 0.36-0.96) and of 50% among women with the first experience of breastfeeding at their age of 30 or greater (RR = 0.50, 95% CI = 0.28-0.90) (Newcomb & Trentham-Dietz, 2000). A Japanese case-control study (Cases = 155, Controls = 96) examined the risk factors for endometrial cancer and found that women who experienced of gravidity and breastfeeding reduced risk for endometrial cancer (OR = 0.34, 95% CI = 0.13-0.92; OR = 0.37, 95% CI = 0.17-0.82, respectively), although this study showed no relationship between duration of breastfeeding and endometrial cancer (Okamura et al., 2006).

2.6.1.3 Low risk of osteoporosis

Ip et al. (2007) stated that breastfeeding for six months or more was a way to minimise fractures after menopause, which caused by osteoporosis. Rather, bone mineral density, which indicates bone strength and fracture risk, improved after weaning (Karlsson, Ahlborg, & Karlsson, 2005). A South African Study with risk factor analysis of the development of osteoporosis reported that no experience of breastfeeding positively related to a higher risk of osteoporosis in females even though it is known that breastfeeding needs calcium mobilization (Blaauw et al., 1994). Schnatz et al. (2010) investigated how the age at first pregnancy, and a history of breastfeeding affected the development of postmenopausal osteoporosis with 619 women. This study highlighted that those women who were 27 years old or greater with breastfeeding experiences, had a lower occurrence of postmenopausal osteoporosis than women who were below 27 years old without breastfeeding experience

2.6.1.4 Effects on maternal metabolism

Gestational diabetes presents in approximately 4% in all pregnant women and becomes more problematic with the increased number of obese in the population (Riorden, 2010). However, the risk of type 2 diabetes in later life can be reduced if mothers continued breastfeeding (Stuebe, Rich-Edwards, Willett, Manson, & Michels, 2005). Gunderson et al. (2010) studied an association between breastfeeding duration and the risk of metabolic syndrome using a cohort technique with 1,399 American women who had delivery experiences. After fully adjusting statistical models, women who breastfed their infants for nine months or longer had a significant risk reduction for the incidence of metabolic syndrome, compared with those who had breastfed for only zero to one month regardless the history of gestational diabetes ($p < 0.001$). If women had gestational diabetes, the preventive effect become greater than non-gestational diabetes women (adjusted Relative Hazard = 0.14-0.56, $p = 0.03$ for gestational diabetes women and adjusted Relative Hazard = 0.44-0.61, $p = 0.03$ for non-gestational diabetes women) (Gunderson et al., 2010). An analysis of cross-sectional cohort study focusing on 2,516 primiparous and multiparous women showed that women with experience of breastfeeding were lower risk of metabolic syndrome (OR = 0.79, 95% CI = 0.63-0.99) (Ram et al.,

2008). The longer duration breastfeeding, the lower risk of the metabolic syndrome in this study (OR = 0.88, 95% CI = 0.77-0.99) (Ram, et al., 2008).

2.6.1.5 Other diseases

In recent years, several studies have documented the advantages of breastfeeding by reducing morbidity from other diseases including cardiovascular diseases, postpartum depression, gallbladder disease, and/or rheumatoid arthritis although these studies still needed to have further investigation (Liu, Beral, & Balkwill, 2009; Pikwer et al., 2009; Stuebe, 2009). These studies concluded that the duration of breastfeeding for at least six months and more positively contributes to the low occurrence of the diseases.

2.6.1.6 Enhancement of mother-infant bonding

Breastfeeding physically brings mother and infant closer together. By attaching to their own infants, women establish a loving relationship with infants. This attachment, referred to as bonding, also provides reassurance between them. Close and immediate contact following delivery and 'rooming-in' after the delivery help this relationship to develop (Rapley, 2002). It is said that infants who received early skin-to-skin contact cry less and their mothers respond to their babies in a more affectionate way, which is important to establish motherhood (Dunn, Davies, McCleary, Edwards, & Gaboury, 2006). Several studies showed that mothers who experienced an immediate skin contact with their baby were more likely to continue breastfeeding (Bramson et al., 2010; Nakao, Moji, Honda, & Oishi, 2008).

2.6.2 Advantages to infants

2.6.2.1 Reducing mortality

Exclusive breastfeeding for six months or longer duration offers an obvious advantage to reducing mortality, particularly the children under five years old, (Chen & Rogan, 2004; Jones, Steketee, Black, Bhutta, & Morris, 2003; Kramer & Kakuma, 2002). According to a UNICEF and WHO report, over eight million children less than five years old died in 2008 and neonates accounted for 41% of these deaths (You, Wardlaw, Salama, & Jones, 2010). If these infants were exclusively breastfed for the first six months through to one year old, approximately 13% of these deaths could be prevented on a worldwide level, which would save over one million

children's lives annually (World Health Organisation, 2007). The majority of the deaths under five year olds occurred in sub-Saharan African and South Asian countries (UNICEF, WHO, & The World Bank UN Population Division, 2007). A Ghanaian cohort study of 10,947 neonates reported that the early commencement of breastfeeding within the first hour to one day after birth reduced the risk of neonatal death by 16% to 22%, respectively (Edmond et al., 2006). In Southern Nepal, a longitudinal study of 22,838 neonates who initiated exclusive breastfeeding within 24 hours after birth found to be at lower risk of mortality than those who had done so after 24 hours, after adjusting several covariates (RR = 1.41, 95% CI = 1.08-1.86) (Mullany et al., 2008). Neonates who were exclusively breastfed also decreased mortality risk than those who were partially breastfed (RR = 1.77, 95% CI = 1.32-2.39) (Mullany, et al., 2008). There is a clear survival advantage in breastfed infants.

An association between breastfeeding experience and the prevention of Sudden Infant Death Syndorome (SIDS) has also benn described, although there is still some controversy about this association (Alm, et al., 2002). A case-control study in Germany (333 cases and 998 controls) found that infants who were exclusivly breastfed were more like to reduce the risk of SIDS maximum 50%, compared with those who were partially breastfed throughout infancy (Vennemann et al., 2009). In this study, infants with partial breastfeeding were still associated with a reduction of SIDS risk (Vennemann, et al., 2009). A combined analysis between cohort and case-control studies concluded that bottle-fed infants faced twice the level of risk of SIDS (pooled OR = 2.11, 95% CI = 1.66-2.68) (McVea, Turner, & Peppler, 2000).

A WHO collaborative study using a pooled meta-analytical approach from six developing countries (Brazil, The Gambia, Ghana, Pakistan, the Philippines, and Senegal) documented the risk of death due to infectious diseases to infants and children under two years old without breastfeeding as given Table 6 (World Health Organization, 2000). Although each study calculated the risk of infant and child mortality, the overall results showed that the number of mortality cases decreased with age, which meant that breastfeeding would provide greater protection for earlier age infants.

While the benefits of 'exclusive breastfeeding' for the first six months are well known, breastfeeding into the second year of life still contributes to survival

advantage for some countries, particularly those with high occurrence of infectious diseases (Cattaneo et al., 2006; Mane, Simondon, Diallo, Marra, & Simondon, 2006). In addition, breastfeeding assists survival in infants born preterm or with a low birth weight (Callen & Linelli, 2005). The protective benefit of breastfeeding is also apparent in low socio-economic areas, which suffer from insanitation and/or poor educational background of mothers (León-Cava, et al., 2002).

Table 6: The infant mortality risk for the first and second year without breastfeeding

	Infants' age	Pooled OR	95% CI
The first year	< 2 months	5.8	3.4-9.8
	2-3 months	4.1	2.7-6.4
	4-5 months	2.6	1.6-3.9
	6-8 months	1.8	1.2-2.8
	9-11 months	1.4	0.8–2.6
The second year	12-15 months	1.6	0.8-3.2
	16-19 months	2.1	1.1-4.0
	20-23 months	1.7	1.0-2.7

(Source: WHO Collaborative Study Team, 2000)

2.6.2.2 Prevention from infectious diseases

Breastfeeding prevents a wide range of infectious diseases which could reduce morbidity. The National Health and Medical Research Council of Australia reviewed sickness prevention resulting from breastfeeding including gastrointestinal tract disease, diarrhoeal illness, respiratory infections, asthma, urinary tract infections, otitis media, bacteraemia-meningitis, inflammatory bowel disease, necrotising enterocolitis (Binns & Davidson, 2003).

Breastfeeding is effective in reducing the diarrhoeal mortality and/or morbidity risk. A prospective cohort study of 7,295 singletons in Netherlands found that exclusive breastfeeding into four months or longer would have greater benefit for lower risk of death from diarrhoeal illness compared with partial breastfeeding (Duijts, et al., 2010). A dataset from an English cohort study with 15,890 infants also recognised that 'exclusive breastfeeding' prevents by half of the hospitalisation caused by

diarrhoea for the first six months, and partial breastfeeding does so for one-third (Quigley, Kelly, & Sacker, 2007). From a 2003 national cross-sectional survey of 1,633 infants in Bangladesh, Mihrshahi et al. (2007) found that the occurrence of diarrhoea infants less than three months was 14.3%. This occurrence was considered closely associated with infants' experiences of exclusive breastfeeding but having pre-lacteal feeding (adjusted OR = 0.69, 95% CI = 0.49-0.98), compared with non-experiences of exclusive breastfeeding (p = 0.039) (Mihrshahi, et al., 2007). A cross-sectional survey, which was conducted in Qatar from 2006 to 2007 with 1,278 infants, aged between one and five, found that the contraction of diarrhoea was significantly lower in infants who were exclusively breastfed than those who were partially breastfed (48.7% vs. 32.5%) and were not breastfed at all (37.3% vs. 32.5%, $p < 0.001$) (Ehlayel, Bener, & Abdulrahman, 2009).

Breastfeeding also protects infants against upper and lower respiratory infections. Results from an American study with a cross-sectional survey of 2,277 infants before their two year birthdays between 1988 and 1994 showed that fully breastfeeding for six months or more minimized the risk of pneumonia than fully breastfeeding for four to six months (1.6% vs. 6.5%) (Chantry, Howard, & Auinger, 2006). The study conduted by Duijts et al. (2010) as discussed earlier, found that exclusive breastfeeding brought greater survival benefits in upper and lower respiratory infections (adjusted OR = 0.65, 95% CI = 0.51-0.83 and adjusted OR = 0.50, 95% CI = 0.32-0.79, respectively). However, some studies did not show a statistical significane between breastfeeding and incidence of respiratory infection. A cluster randomised controlled trials study of 16,491 infants, the Promotion of Breastfeeding Intervention Trial (PROBIT), in Belarus (n = 8,865 intervention group and n = 8,181 control group) showed that 'any breastfeeding', prevalence of 'full' and 'exclusive breastfeeding' for three and six months of life were not related to the reduction of two or more episode of respiratory tract infection (intervention group = 39.2%; control group = 39.4%, adjusted OR = 0.85, 95% CI = 0.57-1.27), although this study was held at the Baby-Friendly Hospital Initiative (BFHI) (Kramer et al., 2001).

Breastfeeding duration gives a positive impact on Urinary Tract Infections (UTIs). A Swedish case-control study investigated 200 cases (89 males, 111females), 336 controls (147 male, 189 female) and reported that non-breastfed infants had a marked tendency towards UTIs rather than breastfed infants (HR = 2.30, 95% CI = 1.56-

3.39) (Marild, Hansson, Jodal, Oden, & Svedberg, 2004). The longer duration of breastfeeding was statistically associated with the morbidity of UTIs and that this effective protection was last for seven months after birth but retained its effectiveness until two years of age (Marild, et al., 2004). The continuation of breastfeeding is strongly recommended to protect UTIs in children, particularly infants, because they are difficult to diagnose of it and are thus more susceptible to developing renal damage (Watson, 2004). Although the protective mechanism of UTIs that breastfeeding offers is unclear, it could be presumed that oligosaccharides and secretory immunoglobulin are involved. Antibodies in breastmilk prevent pathogens from adhering to epithelial cells in the urinary tract (Hanson, 2004).

Evidence from several case-control studies suggests that breastfeeding prevents otitis media. An American study conducted by Philipsen Hetzner et al. (2009) showed that exclusively breast fed infants for the first six months had a low risk of ear infection at two years of age after confounding factor were adjusted for (adjusted OR = 1.55, 95% CI = 1.12-2.14). A study showed that otitis media was common in children with approximately 44% of them contracting this disease within one year of life (Ip, et al., 2007). However, the risk of otitis media doubled if infants were formula-fed, compared to exclusively breastfed infants for three months and beyond (95% CI = 1.4-2.8) (Ip, et al., 2007). In the Czech Republic, a case-control study found that the optimal duration for prevention of otitis media was up to 11 months (OR and lower 90% CI > 1) particularly, the first four months were considered crucial (Vogazianos, Vogazianos, Fiala, Janeček, & Šlapák, 2007).

In summary, breastfeeding, particularly exclusive breastfeeding for the first six months and beyond from childbirth provides important benefits to reduce the occurrence and recurrence of acute infectious diseases.

2.6.2.3 Prevention of chronic diseases

Early exposure of breastmilk substitutes including cow's milk, and solid food raise the morbidity rate of type 1 diabetes and overweight/obesity in later life (Seach, Dharmage, Lowe, & Dixon, 2010; Smith & Harvey, 2010). On the other hand, ‘exclusive breastfeeding’ for the first five months or longer and for seven to nine months in total duration of breastfeeding is effective in preventing of type 1 diabetes in childhood (Sadauskaite-Kuehne, Ludvigsson, Padaiga, Jasinskiene, &

Samuelsson, 2004). The risk of type 2 diabetes is also preventable by breastfeeding. A Canadian case-control study focusing on prenatal and early infancy risk factors of type 2 diabetes highlighted that breastfeeding for more than 12 months protected children against the development of type 2 diabetes (OR = 0.24, 95% CI = 0.13-0.99) (Young et al., 2002). Owen et al. (2006) systematically reviewed the literature and concluded that breastfeeding significantly reduced the prevalence of type 2 diabetes in later life, compared to formula based products (7 studies; 76,744 subjects; OR = 0.61, 95% CI = 0.44-0.85, p = 0.003). Smith and Harvey (2011) estimated the incidence of chronic diseases prevented by breastfeeding and suggested that infants not breastfed had a 20-300% higher risk of acquiring chronic diseases in Australia.

An association between infant formula feeding and the high risk of malignancies in childhood are reported in several studies (Kwan et al., 2005; Martin, et al., 2005). A meta-analysis concluded that infants had breastfeeding for six months and beyond had lower rates of acute lymphoblastic leukemia (ALL) and acute myeloblastic leukemia (AML), compared to those had infant formula (OR = 0.76, 95% CI = 0.68-0.84 and OR = 0.85, 95% CI = 0.73, 0.98, respectively) (Kwan, et al., 2005).

Moreover, many chronic diseases in adulthood are related to dietary status of their perinatal and neonatal periods (Barker, 2006; Godfrey & Barker, 2001). This hypothesis proposes that nutritional conditions, particularly an excessive intake of protein in early infancy, will affect metabolic systems later in life causing overweight/obesity in childhood and adulthood (Wu & Chen, 2009). Therefore, breastfeeding in this period is the most important in terms of providing long-term effects, which enable children to be protected from development of chronic diseases (Horta, Bahl, Martines, & Victora, 2007).

Infants who had full breastfeeding and/or experienced a longer duration of breastfeeding were statistically at lesser risk of overweight/obesity in their later life (Griffiths, Smeeth, Sherburne Hawkins, Cole, & Dezateux, 2009; Valerie et al., 2005). Arenz et al. (2004) undertook a meta-analysis of the association between breastfeeding and obesity in children from the literature and concluded that breastfeeding could have a protective role of childhood obesity (adjusted OR = 0.78, 95% CI = 0.71-0.85) (Philipsen Hetzner, et al., 2009).

Breastfeeding is also significantly associated with a lower risk of inflammatory bowel disease, necrotizing enterocolitis, ulcerative colitis, allergies, Crohn's disease, and cardiovascular disease in later life, compared to artificial feeding (Ip, et al., 2007; Klement, Cohen, Boxman, Joseph, & Reif, 2004; León-Cava, et al., 2002; Schack-Nielsen, Larnkjaer, & Michaelsen, 2005).

2.6.2.4 Allergies, asthma, atopic eczema

Allergic diseases have apparently increased across the world however, breastfeeding possibly decreases the prevalence of these diseases (Ip, et al., 2007; Oddy, de Klerk, Sly, & Holt, 2002; Schneider, Stein, & Fritscher, 2007). In a study of meta-analyse undertaken by Ip et al. (2007), children who were fed by infant formula and had a family history of asthma or atopic eczema had a 1.7 times higher risk of asthma than those who were breastfed for three months or more and had no family history of asthma or atopic eczema (95% CI = 1.2-2.3).

A prospective birth cohort study of 2,602 Australian children showed that 'exclusive breastfeeding' for less than four months significantly increased the risk of childhood asthma at their six years old (OR = 1.36, 95% CI = 1.00-1.85) (Oddy, et al., 2002). A recommendation from this study was to continue 'exclusive breastfeeding' for at least four months postpartum regardless of the maternal history of asthma (Oddy, et al., 2002). The same author also found the similar results in their earlier study (Oddy et al., 1999). If the mothers exclusively breastfed their infants for more than four months the risk factor for all asthma and atopy was significantly reduced at six years of age (Oddy, et al., 1999).

Several Japanese studies reported inconsistent results with this association. Miyake et al. (2003) found that breastfeeding for three months postpartum is significantly associated with the onset of atopic eczema, compare with non- breastfeeding (adjusted OR = 1.56, 95% CI = 1.13-2.22 for 'exclusive breastfeeding', adjusted OR = 1.40, 95% CI = 1.01-1.91), according to a study of 5,614 students aged 12-15 years in Osaka. The same author recently reported in a cross-sectional study of 24,077 children aged 6-15 in Okinawa that 'exclusive breastfeeding' for four to 11 months is positively related to the prevalence of atopic eczema (adjusted OR = 1.18, 95% CI = 1.03-1.35) (Miyake, Arakawa, Tanaka, Sasaki, & Ohya, 2007). On the other hand, a study of 1,957 children aged 3 years in Fukuoka showed that 'exclusive

breastfeeding' for more than four months was associated to the lower prevalence of topic eczema (adjusted OR =0.69, 95% CI = 0.50-0.96) (Tanaka, Miyake, & Sasaki, 2010). However, these studies did not use clear definitions of breastfeeding and did not consider the factors of maternal or family smoking history.

The timing of the introduction of solid foods and breastfeeding duration are still seen as controversial. A literature review showed that infants who had exclusive breastfeeding for less than four months, were at higher risk of atopic disease, however, the development of atopic diseases was not associated with the delayed introduction of solid foods (Greer, Sicherer, & Burks, 2008). Similarly, introduction of solid foods at six months and beyond revealed no evidence to suggest the prevention of atopic diseases (adjusted OR = 1.31, 95% CI = 0.93-1.86) (Zutavern et al., 2006). In a more recent longitudinal study of 1,376 mother-infant pairs, maternal diet including cultural diet during pregnancy was also considered not related to the occurrence of asthma when the infants became three years old (Lange et al., 2010).

2.6.2.5 Enhancing neurocognitive development

It is interesting to note that prolonging breastfeeding enhances the Intelligence Quotient (IQ), cognitive, physical, behavioural, and temperament developments than does artificial feeding, whereas some studies stated that there was no relationship between them due to the difficulties of minimising confounding factors (Kramer et al., 2008; León-Cava, et al., 2002; Schack-Nielsen & Michaelsen, 2006). The beneficial effects of breastfeeding on cognitive development of infants continue through childhood and probably into adulthood.

The Promotion of Breastfeeding Intervention Trial (PROBIT), a large Randomized Trial study conducted in Belarus, assessed associations between the duration of breastfeeding or exclusive breastfeeding and cognitive and academic performances at age 6.5 years, and found that infants with longer duration of breastfeeding, including 'exclusive breastfeeding', recorded higher scores in overall cognitive and academic performance than infants with shorter duration (Kramer, et al., 2008). The largest gap in the scores between these two groups was the performance of verbal IQ, which was the 7.5 score gap (95% CI = 0.8-14.3) (Kramer, et al., 2008). Another randomized trial study evaluating motor development and breastfeeding duration in Honduras reported that infants who had exclusive breastfeeding for four to six

months started to crawl earlier than those who had complementary foods at four months regardless of birth weight (p = 0.007) (Dewey, Cohen, Brown, & Rivera, 2001). Moreover, infants with normal birth weight and four to six months breastfeeding were more likely to start walking at the age of 12 months than infants with normal weight but who were given complementary foods at the age of four months. However, in this association there was statistically no correlation between these factors (p = 0.02) (Dewey, et al., 2001).

These positive associations between the duration of breastfeeding and cognitive outcomes may be related to breastmilk containing more long chain polyunsaturated fatty acids (LCPUFAs) including docosahexaenoic acid (DHA) and arachidonic acid (AA) than formula, which were believed to affect the brain development during for the early infancy (Caspi et al., 2007; Heird & Lapillonne, 2005). In fact, the brains of breastfed infants have higher proportions of DHA and AA than the formula fed ones but the formula used in this study did not contain DHA and AA (Makrides, Neumann, Byard, Simmer, & Gibson, 1994). A recent study with a meta-analysis of randomised trials determined that there was no effective benefits on neurocognitive outcomes compared to the control formula, even if DHA and AA were added to (Simmer, Patole, & Rao, 2008).

2.6.2.6 Orofacial and dental development

Breastfeeding requires infants to apply a more dynamic action in sucking for infants than bottle feeding (Aizawa, Mizuno, & Tamura, 2010; Geddes, Kent, Mitoulas, & Hartmann, 2008). A Brazilian study using electromyogram (EMG) showed that the masseter, temporalis and buccinators muscles were significantly more actively during breastfeeding than in bottle feeding (Karaolis-Danckert, Guenther, Kroke, Hornberg, & Buyken, 2007). A Japanese study found that infants opened their mouths at a wider angle in order to grasp at its mothers' nipple than to grasp at an artificial teat (Aizawa, et al., 2010). A highlight of this study was that infants who continued bottle feeding exhibited a high occurrence of a closed bite in their later life (Ryser, 2004). Several studies concluded that breastfeeding facilitates the proper development of the orofacial muscle and bone in breastfeeding (Karaolis-Danckert, et al., 2007).

2.6.3 Advantages to societies

Breastfeeding brings economic advantages for societies by reducing the costs for hospitalisations and health care during childhood, particularly, the first year of life (Renfrew et al., 2009; Smith, Thompson, & Ellwood, 2002). These costs place a huge financial burden on many countries (Allen & Hector, 2005; Cattaneo, et al., 2006). Although breastfeeding demonstrates a protective role against various diseases including infant diarrhoea, respiratory infection, insulin-dependent diabetes mellitus, and otitis media, the market value of breastmilk by mothers is vague (Cattaneo, et al., 2006; Quigley, et al., 2007; Smith, 2004). The 2002 Australian study estimated that approximately 1-2 million dollars per year was the cost of treatment for diarrhoea, respiratory infection, otitis media, necrotizing enterocolitis, and eczema in the Australian Capital Territory (ATC) alone due to the early termination of breastfeeding (Smith, et al., 2002). In the United States, it is said that 13 billion dollars could be saved annually if 90% of the family continued to exclusively breastfeed their infants for the first six months and would be able to protect an excess of 911 deaths, which is equivalent to 95% of infants (Bartick & Reinhold, 2010). Women in some developing countries cannot afford to purchase formula and other breastmilk substitutes.

Bottle feeding however, requires additional time and costs not only to obtain equipment (bottle and teat) but also to maintain the equipment by using electricity and fuel in order to sterilise them, and make clean boiled water. Breastfeeding is a most valuable feeding method for infants and support of entire community (Binns, 2004).

In summary, breastfeeding is the most effective, efficient, and economical method of reducing morbidity and/or mortality rate of not only children but also mothers and societies (Chen & Rogan, 2004; Labbok, Clark, & Goldman, 2004). Most professionals and government organisations across the world have recommendations for breastfeeding duration, that ‘exclusive breastfeeding’ should be commenced within an hour of birth and continued for the first six months of life.

2.7 Trends of breastfeeding in Australia and Japan

2.7.1 Trends in Australia

Historically, women usually gave birth at home until nineteenth century and childbirth at hospital settings became popular since (Reiger, 1985). A wet nurse was available to feed infants in general, while breastfeeding was also undertaken if women had high socio-economic status (Binns, 2004; Hartmann, Kulski, Rattigan, Prosser, & Saint, 1981). The breastfeeding rate reached its lowest point in the 1960s (Foureur & Hunter, 2006). In those days, there were only 50-60% of women who breastfed their infants at discharge from the hospital, with just 21% of them continuing breastfeeding at three months (Lester, 1994). Moreover, strong markets for infant formula was on the rise after the Nestle's Lactgen was introduced in 1920s (Thorley, 2003). However, breastfeeding rate had gradually improved during the 1970s as people recognised advantages of breastfeeding. During 1989-1990, the Australian Bureau of Statistics (ABS) conducted the first National Health Survey on breastfeeding status and reported that 48% of infants were breastfed at one month, although the definition of breastfeeding was not clear (Lund-Adams & Heywood, 1994).

The 1995 National Nutritional Survey (NHS) found that the 'full breastfeeding' rate at discharge and three months postpartum was 81.9 and 57.1% of women (See Figure 2), respectively (Donath & Amir, 2000c). In this survey, 18.6% of women still continued 'full breastfeeding' at six months postpartum (Donath & Amir, 2000c). The 2001 NHS showed that the initiation rate of breastfeeding improved with 83% at discharge time (Australian Bureau of Statistics, 2003). In more recent years, the 2004 Longitudinal Study of Australian Children (LSAC) documented that the breastfeeding initiation rate was 92%, while the 'full breastfeeding' rate at three months and six months postpartum were 56% (see Figure 3) and 14% respectively (Australian Institute of Family Studies (AIFS), 2008). In 2011, the initiation rate of breastfeeding was 96% and 'full breastfeeding' for three months postpartum was 47.1% (See Figure 3) (Australian Institute of Health and Welfare, 2011a). However, exact interpretation of these datasets is difficult due to the use of cross-sectional survey techniques and varying definitions.

While the initiation rate of breastfeeding has improved over the three decades, the duration rate of not only 'exclusive breastfeeding' but also 'full breastfeeding' has declined. Currently, the Australian government has undertaken a promotion strategy in breastfeeding from 2010 to 2015 which aims to increase the 'full breastfeeding' rate at six months postpartum and continued breastfeeding for 12 months or more with complementary foods (Australian Health Ministers' Conference (AHMC), 2009). The transition of breastfeeding rate was show in Figure 2 and 3.

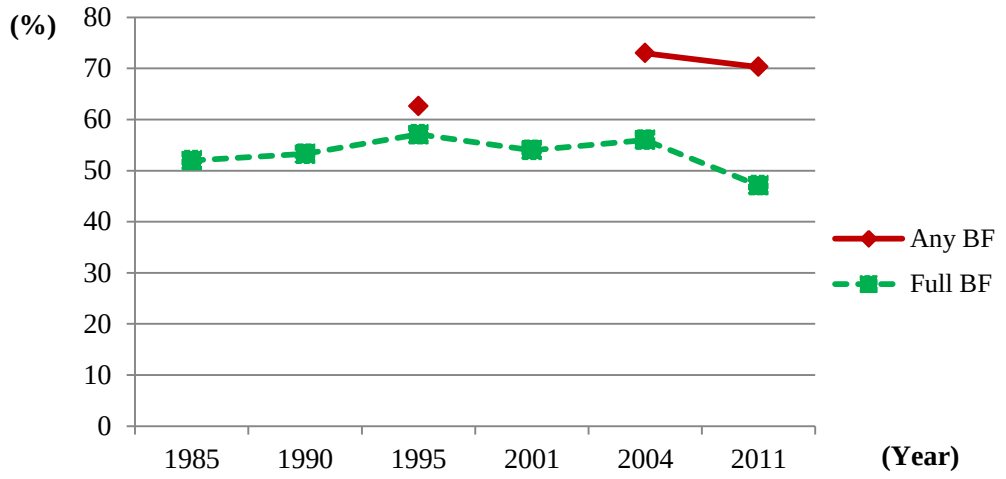


Figure 2: The transitions of BF* rate at three months in Australia from 1985 to 2011

*BF=breastfeeding

Source: Year 1985 and 1990: These (Full BF) are the data only within Victoria (Lester, 1994), 1995: (Donath & Amir, 2000b), 2001: (Australian Bureau of Statistics, 2003), 2004: (Australian Institute of Family Studies (AIFS), 2008), and 2011(Australian Institute of Health and Welfare, 2011a).

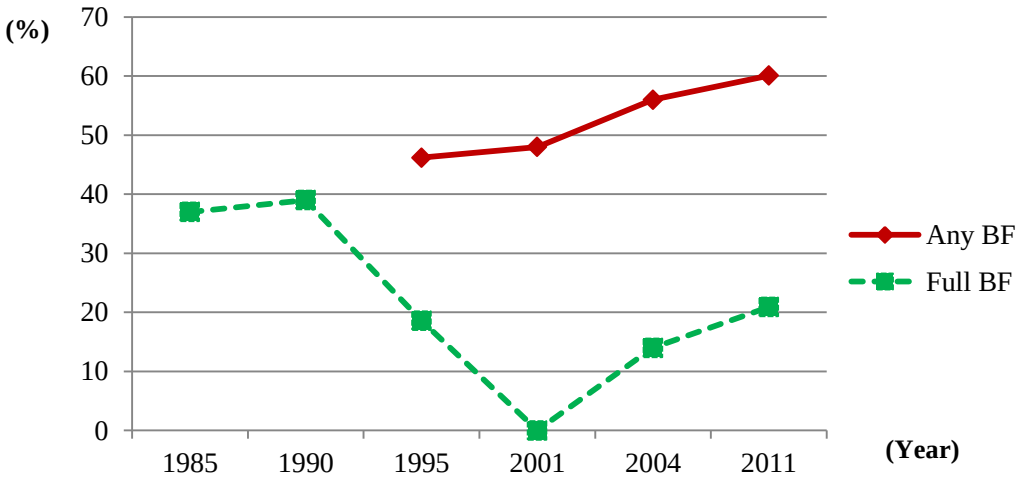


Figure 3: The transitions of BF* rate at six months in Australia from 1985 to 2011

*BF=breastfeeding

Source: Year 1985 and 1990: These (Full BF) are the data only within Victoria (Lester, 1994), 1995: (Donath & Amir, 2000b), 2001: (Australian Bureau of Statistics, 2003), 2004: (Australian Institute of Family Studies (AIFS), 2008), 2011: (Australian Institute of Health and Welfare, 2011a).

2.7.2 Trends in Japan

Breastfeeding was the only practical feeding method to feed infants until the end of the first half of the 20th century (Segawa, 2008). For women, visiting temples or shrines to pray for their ability to have sufficient production of breastmilk was common practice and many special foods were taken to help with lactation (Takeuchi, 2002). Most women delivered at home with the help of a midwife. Breastfeeding lasted until the child was two to three years of age, but breastfeeding up to six years of age was common (Sawada, 1979). If a women had insufficient breastmilk, a wet nurse or rice broth was used for replacement (Segawa, 2008). A wet nurse was used before breastfeeding from the infants' own mothers commenced, as colostrum was thought to be harmful for infants (Sawada, 1979). Infant formula was first introduced to Japan in 1917, but it was not until the 1950s that its use increased rapidly (Palmer, 1991). Formula companies used the advertising slogan 'To become a bright child' in their marketing, and this message suggested that infant formula feeding gave advantages in weight gain and infant development, which increased their popularity among mothers (Palmer, 1991). While the number of deliveries at hospitals and the productive power of formula increased, the 'exclusive breastfeeding' rate declined to its lowest point of 31% at one month in 1970 (see Figure 4).

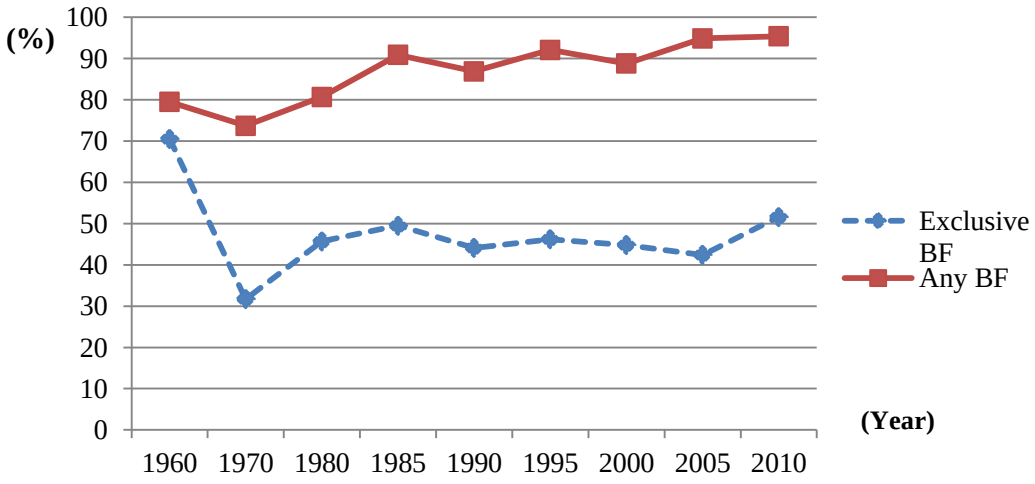


Figure 4: The transitions of BF* rate at one month in Japan from 1960 to 2010

*BF=breastfeeding.

Note: 'Exclusive breastfeeding' can be counted as 'full breastfeeding' due to the lack of clear definitions of breastfeeding status used in Japan. The survey in 2010 was undertaken by the different research team in the government.

Source : From 1960 to 2005: (Ministry of Health Labour and Welfare, 2009a), 2010: (Minister of Health Labour and Walfare, 2011)

In 1975, three goals for restoring breastfeeding rates were set by the Ministry of Welfare based on the 1974 recommendations of the WHO. These were;

1) To exclusively breastfeed infants to 1.5 months after birth
2) To exclusively breastfeed infants to three months if possible, and
3) Not to change to formula, even if after four months of age, without good reasons (Health and Welfare Statistics Association, 1998).

While the 'any breastfeeding' rate has gradually improved from 80.7% in 1980 to 94.9% in 2005 at one months and from 59.5% to 79.0% at three months respectively, the duration of 'exclusive breastfeeding' has remained relatively constant with a slight decline in recent years (see Figure 4 and 5) (Ministry of Health Labour and Welfare, 2007). The National Nutritional Survey of Pre-school Children, which has been carried out every decade since 1985 has shown a decline from 49.5% 'exclusive breastfeeding' at one month in 1985 to 46.2% in 1995 and to 42.4% in 2005, respectively (see Figure 4) (Ministry of Health Labour and Welfare, 2007). The 'exclusive breastfeeding' rate at three months has remained relatively constant at 39.5% in 1985, 38.1% in 1995 and 38.0% in 2005 (see Figure 5) (Ministry of Health Labour and Welfare, 2007).

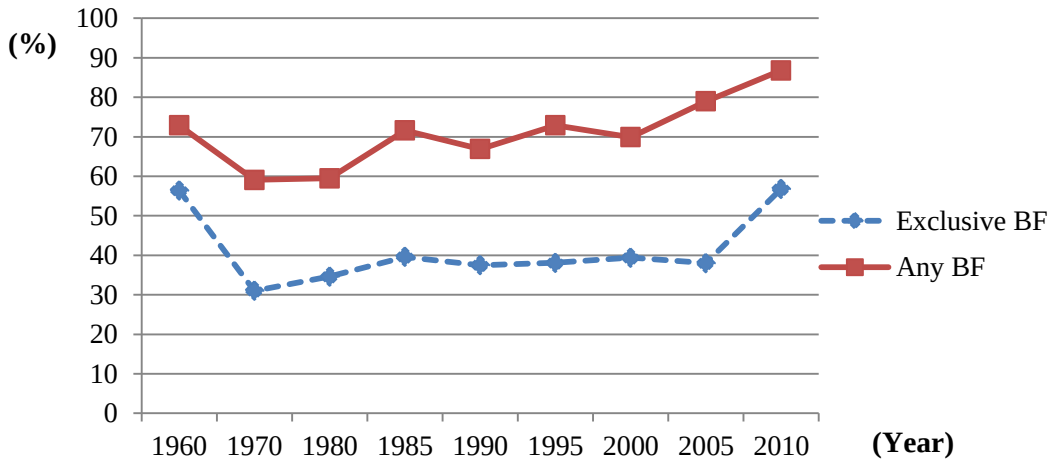


Figure 5: The transitions of BF* rate at three months in Japan from 1960 to 2010

*BF=breastfeeding.

Note: 'Exclusive breastfeeding' can be counted as 'full breastfeeding' due to the lack of clear definitions of breastfeeding status used in Japan. The survey in 2010 was undertaken by the different research team in the government.

Source : From 1960 to 2005: (Ministry of Health Labour and Welfare, 2009a), 2010: (Minister of Health Labour and Walfare, 2011)

Since 2001, the Japanese government has undertaken a health promotion project, 'Healthy and Happy Family 21 (Sukoyaka Oyako 21)' that included a goal to improve the rate of 'exclusive breastfeeding' at one month postpartum by 2014. The 2010 interim report on the project stated that although more than 95% of women intended to breastfeed their infants before delivery, the rate of 'exclusive breastfeeding' at one month postpartum had not changed since 2005 (Ministry of Health Labour and Welfare, 2007, 2010a). No specific target was set at the beginning of this project and it was hard for health professionals to evaluate if the goal was achieved. Subsequently in 2010, a target was set of 60% 'exclusive breastfeeding' at one month postpartum (Ministry of Health Labour and Welfare, 2010a).

In 2011, another National Survey on Children's Growth reported that the rate of 'exclusive breastfeeding' was 51.6% at one month (see Figure 2.3) and 56.8% at three months of life, respectively (see Figure 2.4) (Minister of Health Labour and Walfare, 2011). In this survey, 'any breastfeeding' also increased by 95.4% at one month and 86.8% at three months. Compared with the previous rates in breastfeeding in Japan, the latest rates of 'exclusive breastfeeding' seemed to be improved. However, the WHO definitions of breastfeeding was not applied in this study as mentioned earlier, therefore, it was very difficult to interpret these results.

2.8 Factors that influence breastfeeding duration in Australia and Japan

Many factors that positively and negatively influence breastfeeding duration have been studied and can be classified into the following categories:

2.8.1) maternal

2.8.2) infant, and

2.8.3) socio-environmental.

The maternal attribute can then be sub-divided into three groups:

2.8.1.1) maternal-demographic related

2.8.1.2) maternal-physical related, and

2.8.1.3) maternal-psychological related as shown in Figure 6.

While there are many studies on factor analysis on breastfeeding practice, there are a few studies on this topic in Japan even if there is written in Japanese.

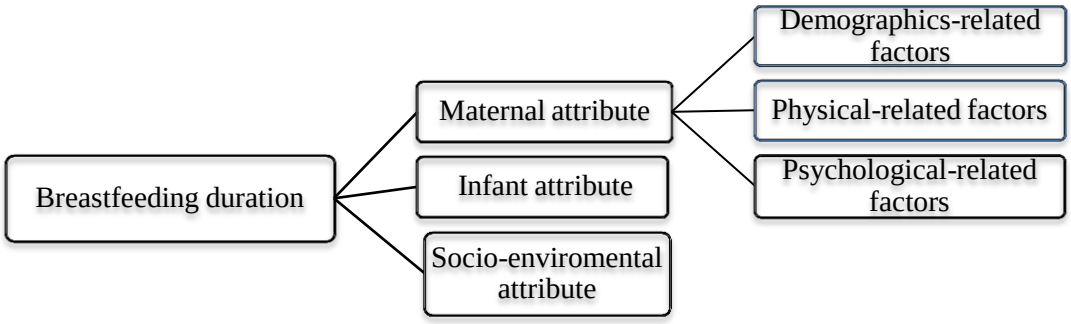


Figure 6: Classification of breastfeeding factors

2.8.1 Maternal attribute

2.8.1.1 Demographic-related factors

The factors in this group include age, socioeconomic/educational status, smoking habits, parity, employment status, marital status, and delivery method. From the literature, maternal age and socioeconomic/educational status positively influence the duration of breastfeeding, whereas smoking habits, parity, and marital status, are negatively related to the duration of breastfeeding (Scott, Binns, Oddy, & Graham, 2006).

- **Age**

Previous studies have reported that the higher maternal age was positively associated with a longer duration of breastfeeding in major western countries including Australia (Blyth et al., 2004; Forster, McLachlan, & Lumley, 2006), Canada (Dubois & Girard, 2003), the United States (US) (Ertem, Votto, & Leventhal, 2001; Kuan et al., 1999), and Finland (Erkkola et al., 2010). In South-East Asian countries like Indonesia, Vietnam, Cambodia and Timor-Leste, maternal age is not consistent with exclusive breastfeeding rate at six months of age (Senarath, Dibley, & Agho, 2010),

while other Asian countries, like Hong Kong, Taiwan, and South Korea, showed the same tendency as major Western countries. However, a study in China found that young-aged mothers tended to continue breastfeeding for longer than old-aged mothers. Choosing bottle-feeding is more fashionable or is focuses more on concerns about body shape change for this generation. There also might be a relationship to the degree of the women's participation in public affairs in China.

In Japan, a cross-sectional study using the data from a National Survey of 46,569 infants documented that mothers in their 30s had the highest rate of exclusive breastfeeding at six months compared to other generations (OR = 1.20, 95% CI = 1.14-1.26) (Kaneko et al., 2006). However, a population based survey at the local level in Japan showed that the mean age of mothers who choose formula feeding was significantly younger than those who choose exclusive and any breastfeeding ($p < 0.001$) (Yokoyama et al., 2006).

- **Socioeconomic/educational status**

In most developed countries, higher education, family income, or social ranks of the family were positively associated with breastfeeding initiation and duration (van Rossem et al., 2009; Wen, Baur, Rissel, Alperstein, & Simpson, 2009). In some developing countries, however, mothers with a higher income, education and social status were more likely to choose bottle feeding than those with a low socioeconomic and educational background (Dennis, 2002). Bottle feeding may be seen as a modern or western fashion for some women in these countries (Rogers, Emmett, & Golding, 1997).

In Australia, the 1995 National Health Survey of 3,252 children using a cross-sectional approach indicated that socioeconomic status influenced the breastfeeding rate and duration of breastfeeding (Donath & Amir, 2000b). The higher socioeconomic status the children's family had, the higher rate and the longer duration of exclusive and any breastfeeding their mothers undertook (Donath & Amir, 2000b). A joint survey in Western Australia and Tasmania conducted between 1984 and 1985 also showed similar results as previous studies-that mothers in the higher social groups breastfed their infants more and longer than those in lower social groups (Abrams, Altman, & Pickett, 2000). A study found that Australian mothers with tertiary education were 1.5 times more likely to be aware of the WHO

recommendation on 'exclusive breastfeeding' than those who with school certificate or less (adjusted RR for age = 1.45, 95% CI = 1.08-1.94, p = 0.02) (Wen, et al., 2009). When adjusting employment status, the relative risk of awareness of this recommendation was 5.6 times (95% CI = 3.53-8.90, p < 0.001) (Wen, et al., 2009).

In Japan, there are a few studies that investigated the relationship between the duration of breastfeeding and the mother's socioeconomic/educational status (Haku, 2007). Kaneko et al. (2006) documented that mothers with a higher annual family income (more than 8.0 million yen) were more likely to continue exclusive breastfeeding at six months, according to a cross-sectional study conducted by the Ministry of Health and Welfare. It needs to be noted that it is difficult for researchers to investigate the annual income of families in Japan due to privacy issues.

- **Employment status**

Returning to work is the main reason for working women to cease breastfeeding (Arthur, Saenz, & Replogle, 2003; Li, Li, Ali, & Ushijima, 2003). If the women are the main income earners, this tendency is more apparent (Chatman et al., 2004). Employment status is a barrier for women to initiate and continue breastfeeding in countries like Britain, Ireland, and the United States (Hawkins, Griffiths, Dezateux, & Law, 2007b). In a cohort study focusing on 228,000 American postpartum women, Ryan et al. (2006) found that there was twice likelihood for unemployed women to continue breastfeeding at six months, compared to those who employed with full-time status (OR = 2.08, 95% CI = 2.03-2.13). However, in countries like Greece and Sri Lanka, there was a tendency for employed women to continue breastfeeding at levels higher than in their unemployed counterparts (Butler et al., 2007; Senarath, et al., 2010).

In Australia, Cooklin et al. (2008) examined 3,697 infants in a longitudinal study and reported that postpartum women who were employed in full-time jobs, particularly those who returned to their work before six months, were strongly associated with discontinuation of breastfeeding (adjusted OR = 0.35, 95% CI = 0.22-0.55). While several studies showed that maternal employment status had a negative impact on the duration of breastfeeding, there were no randomised controlled trials or quasi-

randomised controlled trials (RCTs) studies to support and promote breastfeeding for working mothers in Australia (Abdulwadud & Snow, 2007).

Compared to the number of studies undertaken in Australia, there is a dearth of Japanese studies related to breastfeeding practices and maternal employment status. In a 2001 national study using a cross-sectional survey, interestingly, Japanese women who had full-time jobs and who were currently on childcare leave for more than six months tended to continue exclusive breastfeeding for six months than unemployed women (adjusted OR = 1.14, 95% CI = 1.05-1.23) (Kaneko, et al., 2006).

Employment policy and supportive programs regarding breastfeeding at work are also important for postpartum women to continue breastfeeding with a better atmosphere of acceptance. Initiatives that might increase the duration of breastfeeding include employment with flexible hours, use of breast-pumping or expressing breastmilk, breastfeeding breaks during work hours, and/or long paid maternity leave (Hawkins, Griffiths, Dezateux, & Law, 2007a; Kosmala-Anderson & Wallace, 2006).

Expressing breastmilk is a useful and practical skill to empty the breast and can avoid the development of mastitis and produce breastmilk for the next feed (Binns, Win, Zhao, & Scott, 2006). The use of the expressed breastmilk enables working mothers to establish an emotional connection between infants, which gives them a motivation to continue breastfeeding (Win, Binns, Zhao, Scott, & Oddy, 2006). The proportion of postpartum women who express breastmilk grows about half in the first six weeks and decreases by about a quarter at 22 weeks (Binns, et al., 2006). A cohort study of 587 mothers in Perth, Australia, reported that postpartum women who used expressed breastmilk at one or more time periods were more likely to continue any breastfeeding up to six months (RR = 0.71, 95% CI = 0.52-0.98) than were those who never did so (Win, et al., 2006).

In 2000, the Maternity Protection Convention 183 and Recommendation 191 were addressed by from the International Labour Organization (ILO). In the convention, all employed women have the right to take maternity leave, and to have job security, health protection in the workplace, and nursing breaks or a reduction in hours of work for breastfeeding. Recommendation 191 also stated guidelines for national

policy and action for countries in regard to working conditions and practices including working women.

- **Smoking status**

Women who smoke are less likely to intend, initiate, and continue breastfeeding than those who are non-smokers (Butler, Williams, Tukuitonga, & Paterson, 2004; Ladomenou, et al., 2007). Australia is no exception. There are approximately one quarter to one third of pregnant or lactating women who habitually smoke and a study of Giglia et al. (2006a) found that women who smoked during pregnancy were associated with a lower prevalence and shorter duration of breastfeeding (RR = 1.59, 95% CI = 1.22-2.08). Smoking cessation during pregnancy was also significantly associated with breastfeeding for more than six months (OR = 3.70, 95% CI = 1.55-8.83) (Giglia, Binns, & Alfonso, 2006b). A cross-sectional study of 9,618 infants in New South Wales, Australia, revealed that mothers who smoked were less likely to breastfeed these infants than those non-smoking mothers (OR = 1.72, 95% CI = 1.51-1.96) (Yeoh, Eastwood, Phung, & Woolfenden, 2007).

The numbers of female smokers in the majority of Asian countries is considerably lower than western countries and the number of male smokers in Asian countries. In China, male smokers represented 63%, while only 4% were female in 1996 (Xu, Binns, Zhang, Yang, & Zhao, 2010). Likewise Western countries, a negative association between maternal smoking and breastfeeding outcomes were observed. A cohort study of 6,747 mother-infant pairs in Hong Kong reported that maternal smoking were negatively correlated with initiating of breastfeeding (OR for ever maternal smoking = 2.51, 95% CI = 1.63-3.86) (Leung, Ho, & Lam, 2002).

In Japan, the smoking rate in women was 11.6% in 2003 and 9.1% in 2008, which is a higher percentage than in other Asian countries (Ministry of Health Labour and Welfare, 2009a). Among women in their 20s and 30s, this rate was even higher by 14.3% and 18.0% respectively, although these groups took the first and second highest reproductive age (Ministry of Health Labour and Welfare, 2009a). Haku and Onishi (2004) stated that smoking women tended to rely more on formula feeding. Similarly, in the study by Kaneko et al. (2006), fewer mothers who smoked at home were still breastfeeding at six months, compared to non-smoking parents (adjusted OR = 0.44, 95% CI = 0.34-0.57). The risk of ceasing breastfeeding by mothers was

decreased when only fathers were smokers compared to non-smoking parents (adjusted OR = 0.92, 95% CI = 0.88-0.97) (Kaneko, et al., 2006).

- **Parity**

Parity may positively or negatively contribute to the breastfeeding duration. If the women had positive experiences about breastfeeding issues, this will link with subsequent pregnancies. Scott (1997) stated that parity might be confounded by maternal age. In the countries with a low birthdate, women may focus on more breastfeeding as breastfeeding benefits are not well recognised. On the other hand, women may be discouraged to continue breastfeeding if their workload in the family is heavy. Previous studies including Australia found no association between parity and breastfeeding duration even if adjusting several confounders (Hill, Humenick, Argubright, & Aldag, 1997; Scott, et al., 2006). However, parity was related to the breastfeeding duration in Japan. Multiparous women were more likely to continue 'exclusive breastfeeding' for six months postpartum than those who were primiparous (adjusted OR for second delivery = 1.72, 95% CI = 1.63-1.81; adjusted OR for third delivery = 2.06, 95% CI = 1.91-2.22) (Kaneko, et al., 2006).

- **Delivery methods**

Several studies highlighted that caesarean section negatively impacted on the initiation and duration of breastfeeding. According to a prospective study of 602 mother-baby pairs in China, infants via caesarean section delayed initiation of breastfeeding and had a shorter duration of breastfeeding compared to infants via vaginal delivery (RR = 1.21, 95% CI = 1.10-1.33) (Wang, Zhou, Zhu, Gao, & Gao, 2006). Similar results were shown in studies of South Korea (Chung, Kim, & Nam, 2008), Taiwan (Chien & Tai, 2007), Niger (Awi & Alikor, 2006), German (Kohlhuber, Rebhan, Schwegler, Koletzko, & Fromme, 2008), and New Zealand (Butler, et al., 2004). Nissen et al. (1996) pointed out that levels of oxytocin and prolactin, which are important hormones for breastfeeding, were significantly increased in mothers with virginal delivery than with caesarean delivery.

In Australia, the national rate of caesarean section has increased from 18.0% in 1991 to 30.9% in 2007 (Laws & Sullivan, 2009). The Australian Aboriginal population were even higher with approximately 50.4% (Binns et al., 2004). A study focusing on 92 pregnant women at 18 weeks of gestation found that 71.4% of them assumed

caesarean section to be easier way of delivery than vaginal delivery (Walker, 2004). Although some women medically needed to choose a caesarean section, delivery methods, which did not archive vaginal birth was associated to early ceasing of breastfeeding. According to a cohort study of 298 women in Victoria, the primiparous women who did not vaginally give a birth were more likely to stop breastfeeding before the first three months (OR = 0.387) (James, 2004). Similarly, a cohort study of 4,679 Australian women showed that caesarean section was more likely to introduce complementary feeding within one month after delivery (Baxter, Cooklin, & Smith, 2009).

In Japan, the majority of women choose vaginal delivery and caesarean sections are often chosen by women when recommended by their medical doctors. The rate of caesarean sections has been increasing in recent years in similar ways to some Asian countries, including China and Korea (Betran et al., 2007; Qiu, Binns, Zhao, Lee, & Xie, 2008). In 1987, this rate was 9.9% at hospitals and 6.5% at clinics while it became 23.3% and 13.0%, respectively (Ministry of Health Labour and Welfare, 2008b). There are fewer studies that investigated breastfeeding outcomes in relation to delivery methods in Japan. A study of 234 Japanese mothers found that vaginal delivery was associated with higher 'any breastfeeding' rates to three months postpartum, compared to those who had caesarean sections ($\chi^2 = 180.84$, df = 2, $p < 0.01$) (Izaki, 1999).

2.8.1.2. Physical-related factors

This group of factors includes nipple problems and lactation mastitis, and tends to be negatively associated with initiation and duration of breastfeeding.

- **Nipple problems and mastitis**

Mastitis is a common acute inflammation of the interlobular connective tissue within the mammary gland, which highly occurs during the first few weeks postpartum (Barbosa-Cesnik, Schwartz, & Foxman, 2003). A study demonstrated that cracks and nipple sores (risk factors of mastitis) occurred at a much higher frequency than mastitis, with the highest incidence in the first (36%) and second (14%) weeks postpartum (Foxman, D'Arcy, Gillespie, Bobo, & Schwartz, 2002). While some studies stated that nipple problems and mastitis affected to the length to breastfeed,

there are no consistent results in this association (Amir, Forster, Lumley, & McLachlan, 2007; Barbosa-Cesnik, et al., 2003; Foxman, et al., 2002).

In Australia, a study of randomised controlled trials (n = 1,193) showed that 53% of women experienced mastitis in the first four weeks postpartum and nipple damage was associated with mastitis (adjusted OR = 1.7, 95% CI = 1.14-2.56) (Amir, et al., 2007). In New South Wales, a cohort study of 1,075 breastfeeding women found that 20% (95% CI = 18%-22%) of them developed mastitis in the six months after delivery, and most cases of mastitis (75%) occurred within seven weeks after delivery (Kinlay, O'Connell, & Kinlay, 2001). In Western Australia, mastitis was ranked third as a reason for the cessation of breastfeeding and 18% of women stopped breastfeeding due to mastitis (Fetherston, 1997).

In Japan, breast problems including mastitis, nipple trauma, and sore nipples are common reasons for discontinuation of breastfeeding among postpartum women, but there are relatively few reported studies. A study of 163 Japanese mothers living in Australia reported that 6.9% of them cited nipple soreness as a reason for stopping breastfeeding (Utaka, et al., 2005). Breastfeeding are not essentially accompanied with pain however, many of them complained nipple soreness. In order women to continue breastfeeding with a long duration, it is important for health professionals to assess the cause of the pain and troubles in breast. The World Health Organisation (WHO) has still recommended women who have mastitis during lactation to continue breastfeeding unless they feel breast pain.

- **Maternal obesity**

Almost all women increase their weight during pregnancy, although this weight gain varies greatly between individuals. The Institute of Medicine (IOM) in the United States stated that the optimal total weight gain for pregnant women was based on the Body Mass Index (BMI) of women in pre-pregnancy (Institute of Medicine, 1990; Rasmussen & Yaktine, 2009). Abrams et al. (2000) stated that a woman would have a low risk of birth if her gestational weight gain was within the IOM recommendation.

Many studies found that overweight or obese women were more likely to discontinue breastfeeding than non-obese women (Baker, Michaelsen, Rasmussen, & Sorensen, 2004; Oddy et al., 2006). The reason why obese woman had a shorter duration of

breastfeeding was said that there were different hormonal levels from normal weight woman. Overweight/Obese women also tended to be depressed and have low self-efficacy in the postpartum period, which are significantly related to the short duration of breastfeeding.

In Australia, data from personal interviews (n = 1,991) showed that 82.3% of the obese women (BMI ≥ 30) were less likely to initiate breastfeeding with (95% CI = 77.6-87.0), compared with those who are not obese (BMI = 20-25) with 89.2% (95% Cl = 87.4-91.0) (Donath & Amir, 2000a). The mean duration of breastfeeding was also significantly different between these two groups (28.7 weeks, 95% CI = 27.7-29.8 for BMI < 25 and 22.7 weeks, 95% CI = 20.1-25.2 for women's BMI ≥ 30) (Donath & Amir, 2000a). The same authors conducted a longitudinal study of 3,075 women and confirmed that overweight (BMI 25 to < 30) and obese (BMI ≧ 30) women who breastfed their infants for one week postpartum were more likely to discontinue breastfeeding before six months with 1.26 (95% CI = 1.04-1.53) and 1.38 (95% CI = 1.10-1.73) times, respectively, compared to women with normal weight (BMI=20-24.9) (Donath & Amir, 2008).

Japanese women are concerned about their body weight and there was only a small number of them classified as 'obese' (25 ≤ BMI) (Note: this is the Japanese definition where a BMI > 25 is regarded as 'obese' instead of 'overweight') (Sugawara et al., 2010). There are a few reported studies that examined the association between women's BMI and their infants' birth weight but relatively few study for breastfeeding outcomes in relation to women's BMI.

2.8.1.3 Psychological-related factors

Maternal confidence is positively associated with intention and continuation of breastfeeding, whereas women's perception of insufficient breastmilk supply and postpartum depression affect negatively.

- **Maternal confidence and insufficient breastmilk supply**

The intention to breastfeed is based on women's confidence levels and positive attitudes towards breastfeeding (Haughton, et al., 2010; Ryser, 2004). Self-efficacy level is often used as an indicator of maternal confidence level (Blyth et al., 2002). Postpartum women with a high self-efficacy level are more likely to initiate and

continue breastfeeding than those who with a lower level (Baghurst, et al., 2007; Taveras et al., 2003).

A longitudinal study (n = 300) reported that the Australian postpartum women with a higher level of self-efficacy were 1.59 times more likely to continue 'any breastfeeding' at four months postpartum, compared with those who had a lower level (95% CI = 1.15-5.56, $p < 0.05$) (Blyth, et al., 2004). A case-control study that examined associations between self-efficacy levels and breastfeeding duration amongst Australian women showed that the women who had more confidence about breastfeeding were more likely to continue 'exclusive breastfeeding' to 12 weeks postpartum (OR = 1.1, 95% CI = 1.0-1.1, $p < 0.001$), although there were no differences about self-efficacy levels and breastfeeding duration between the case and the control group (Hauck, et al., 2007).

Maternal perception of breastmilk insufficiency is a universally common reason given for terminating breastfeeding and/or introducing supplemental feeding for their infants (Gatti, 2008). However, physiological studies have suggested that only 1-5% of women have actual problems with milk production and supply (Binns & Davidson, 2003; Law, Dunn, Wallace, & Inch, 2007). The women often felt breastmilk insufficiency within six months after birth (McCann & Bender, 2006).

In Japan, maternal confidence is often studied as related to their perceptions of insufficient breastmilk supply. The relationship between the maternal confidence in breastfeeding and the breastfeeding duration was observed similar results to studies in other countries. A cross-sectional study of 262 postpartum women showed that 'perceived insufficient breastmilk' at four weeks postpartum was significantly associated with 'breastfeeding self-efficacy' level at immediate postpartum periods after birth ($r = 0.45$, $p < 0.001$) (Otsuka, Dennis, Tatsuoka, & Jimba, 2008). In this study, the majority (73.1%) cited insufficient milk flow as their main reason for the supplementation (Otsuka, et al., 2008). These women may feel guilty at not being able to breastfeed. Encouraging these women to exclusively breastfeed their infants is more likely to make a focus of criticism in terms of giving women added mental pressure and stress in Japan (Nakai & Hamasaki, 2009). Some women have misinterpreted infants' behaviours as a sign of insufficient breastmilk (Yamamoto, Tanak, & Takano, 2009).

- **Postpartum depression**

Postpartum depression occurs approximately 10-15% of all women across the world (Halbreich & Karkun, 2006). This is known as a factor to be negatively associated with early termination of breastfeeding (Henderson, Evans, Straton, Priest, & Hagan, 2003). In a Canadian study (n = 526), women who were depressed during the postpartum period were less likely to continue breastfeeding (adjusted OR = 0.28, 95% CI = 0.11-0.71, p = 0.007) (Dunn, et al., 2006). Misri et al. (1997) stated that symptoms of postpartum depression occurred before breastfeeding. From a study of 1,436 pregnant women in the United States, Fairlie et al. (2009) found that the women who were anxious in pregnancy and were depressive in prenatal period were approximately twice as likely to intend formula feeding (n = 1,436) (adjusted OR = 1.92, 95% CI = 1.11-3.33 for prenatal depressive symptoms; adjusted OR = 1.99, 95% CI = 1.12-3.54 for high pregnancy related anxiety).

In Australia, the occurrence of postpartum depression varies between states (Buist et al., 2008). The highest occurrence of postpartum depression was South Australia (n = 2,175) and Queensland (n = 751) in both states a prevalence of 10.2%, compared with Western Australia with 5.6%, which was the lowest reported rate (Buist, et al., 2008). A cohort study of 1,745 women demonstrated that women who had postpartum depression were 1.25 times more likely to cease breastfeeding at early stage than non-postpartum depressive mothers (95% CI = 1.03-1.52) (Henderson, et al., 2003). Similarly, Forster et al. (2006) studied 981 primiparous women and found that depressed women at six months postpartum tended to cease breastfeeding at six months, compared with the non-depressive women (adjusted OR = 0.64, 95% CI = 1.35-1.86). A comparative study of two Australian populations, women in urban (n = 908) and rural area (n = 1,058) found that women in the urban area were more likely to become depressive at antenatal period than in the rural area (8.5% vs. 3.4%, p = 0.006), while the prevenance of postpartum depression between both populations was not significant (6.6% vs. 8.5%, p = 0.165) (Bilszta, Gu, Meyer, & Buist, 2008).

In Japan, it is reported that 12.8% of all women were depressed during the postpartum period in 2010, which was less than the reported 13.4% in 2008 (Ministry of Health Labour and Welfare, 2010a). A cohort study (n = 675) found that the primiparous women were significantly associated with postpartum depression at early stage, which occurs within four weeks after delivery (OR = 2.6, 95% CI = 1.5-

4.4) (Mori et al., 2011). This study also showed that the women who were less than 25 years old or more than 35 years old were more like to appear depressive symptoms between five and 12 weeks postpartum (< 25 years: OR = 3.6, 95% CI = 1.2-11.2, and ≥ 35 years: OR = 2.5, 95% CI = 1.1-5.8) (Mori, et al., 2011). The authors concluded that lack of emotional support and a past history of depression predisposed to postpartum depression (Mori, et al., 2011). Milgrom (2008) stated that postpartum depression was predicted by support level from women's husband/partner. The less support that the women have, the more postpartum depression of the women tends to occur. In a meta-analysis of postpartum depression in Asian countries, women in Asia expressed their depressive symptoms in different ways from Western women (Halbreich & Karkun, 2006).

2.8.2 Infant attribute

2.8.2.1 Sucking ability

Sucking ability is important for infant not only to efficiently gain breastmilk but also to reduce breast problems including cracked nipple and nipple soreness. Infants who were born with low birth weight, preterm, with ankyloglossia, and genetic reasons tended to generate low sucking vacuum, which indicated insufficient breastmilk gain and difficult for attachment (Geddes et al., 2010; Lau, Sheena, Shulman, & Schanler, 1997; Mizuno & Ueda, 2003). As a result these infants have an increased risk for breastmilk in sufficiency (Walker, 2011a). In order for these infants to support breastfeeding, it is important to support mothers and to monitor weight gain of infants (Walker, 2011a).

2.8.2.2 Low birth weight, preterm infants, multiple births

Infant birth weight below 2,499g is recognised as a low birth weight and an infant who was born before the 37 completed week (259 days) of gestation is a preterm infant (Laws, Li, & Sullivan, 2010). These factors are often reported as predictors for the discontinuation of breastfeeding (Flacking, Nyqvist, & Ewald, 2007; Piper & Parks, 1996). However, the needs related to breastfeeding for these infants were same as singleton, infants with normal weight and term birth (Smith & Riorden, 2010).

In 2006, the average birth weight for babies born in Australia was 3,370g and the rate of low birth weight in Australia was 6.1% in 2008, which was the lowest from 1999 to 2008 (Laws, et al., 2010). For indigenous women, the rate of low birth weight was 6%, which was more than twice the rate of all infants (Australian Bureau of Statistics, 2007). Some Australian studies failed to find any association between infant birth weight and breastfeeding duration (Forster, et al., 2006; Scott, et al., 2006). However, preterm infants and infants with low birth weight often need admission to a Neonatal Intensive Care Unit (NICU), which is also a factor related to a shorter duration of breastfeeding (Baxter, et al., 2009). Hurst and Meier (2010) concluded that breastfeeding outcomes for these infants and mothers could be improved when support systems and accurate information on breastfeeding were provided. Multiple birth rates in Australia were 1.6% in 2008 (Laws, et al., 2010). A study (n = 4,679), called 'The Longitudinal Study of Australian Children (LSAC)' found that a multiple birth was negatively associated with an introduction of complementary feeding between births to one month postpartum (Baxter, et al., 2009). However, several studies reported that the women who had a multiple birth are able to produce the most or all of breast milk amount that need for two to four infants (Auer & Gromada, 1998; Berlin, 2007).

In Japan, the rate of low birth weight was 9.8% in 2011 while this rate has been steadily increasing from 9.5% in 2005 (Boshi Hoken Jigyoudan, 2011). Low birth weight infants, preterm infants, and multiple births have negatively influenced the duration of breastfeeding, particularly for the first six months according to a study by Kaneko et al. (2006) that was discussed earlier. In this study, having multiple birth increased the likelihood of early cessation of breastfeeding (adjusted OR = 0.07, 95% CI = 0.04-0.12). A comparative study showed that mothers who had twins, triplets and higher multiples were 2.44 times more likely to choose bottle feeding than those who had a singleton (Yokoyama, et al., 2006).

2.8.3 Socio-environmental attribute

2.8.3.1 Support from family, friends, and society

Support and encouragement from family, friends, and society is important for women to initiate and continue breastfeeding (Sikorski, Renfrew, Pindoria, & Wade, 2003). The 'mother of the mother' has a positive influence on breastfeeding initiation and its

continuation (Ekstrom, Widstrom, & Nissen, 2003). When ‘mothers’ have knowledge about the importance of ‘exclusive breastfeeding’, ‘their daughters’ tended to have a longer duration of breastfeeding (Ekstrom, et al., 2003). Husbands’/partners’ presence during hospitalisation including labour, also had a beneficial impact on the duration of ‘exclusive breastfeeding’ for women (Pisacane, Continisio, Aldinucci, D'Amora, & Continisio, 2005).

In a qualitative exploratory study of 48 Australian women and 28 their husbands (partners), it emerged that husbands/partners themselves would like to get involved in childcare and to learn more about breastfeeding. These processes enabled them to be able to help physically, emotionally and practically and assist their wives in feeding (Tohotoa et al., 2009). The same authors developed a perinatal education intervention about breastfeeding benefits, roles as a father, and the importance of communication to Australian men whose wives (partners) were pregnant (n = 342) (Tohotoa et al., 2011). The perinatal education received positive evaluations and the authors concluded perinatal education would enhance their fatherhood practices (Tohotoa, et al., 2011). Scott et al. (2006) in an Australian study of 587 women reported that a risk of cessation of ‘full breastfeeding’ to six months postpartum was significantly reduced when husbands preferred breastfeeding (adjusted HR = 0.71, 95% CI = 0.55-0.91). In addition, this study showed that maternal grandmothers’ preference toward breastfeeding was identified as significant to ‘any breastfeeding’ to 12 months postpartum (Scott, et al., 2006).

A Japanese study found that women who had multiple births and minimal support from other family members, particularly from their spouses/partners, were less likely to continue ‘exclusive breastfeeding’ and tended to choose formula feeding (OR = 1.83) (Yokoyama & Ooki, 2004). Kaneko et al. (2006) showed that women who could discuss childcare with their partners were more likely to continue ‘exclusive breastfeeding’ for six months (adjusted OR = 1.07, 95% CI = 1.00-1.14). However, the same study also reported that women who did not live with their mothers and fathers (grandparents of infants) were positively associated with breastfeeding status at six months after birth, compared with those who lived with their parents (adjusted OR = 1.14, 95% CI = 1.07-1.21) (Kaneko, et al., 2006). Compared with their Canadian counterparts, the Japanese husbands were significantly less supportive during women’s postpartum periods in terms of giving time for their family

(Steinberg & Kruckman, 2000). Without such support, some Japanese women felt more isolated, and some did not even expect their husbands to participate in childcare or home duties (Steinberg & Kruckman, 2000).

2.8.3.2 Professional support

Support from health professionals offer to women is able to increase the initiation and duration of breastfeeding (Qiu, Xie, Lee, & Binns, 2007). From a randomised controlled trial (RCT) in Singapore of 450 women, Su et al. (2007) found that women who received extra breastfeeding support from health professionals during the postnatal period were more likely to continue 'exclusive breastfeeding' for two weeks (RR = 1.82, 95% CI = 1.14-2.90), six weeks (RR = 1.85, 95% CI = 1.11-3.09), three months (RR = 1.87, 95% CI = 1.03-3.41), and six months (RR = 2.12, 95% CI = 1.03-4.37), compared with those who received only routine care. Antenatal classes provided by health professionals are also one of professional support and are known to positively influence the duration of breastfeeding. Britton et al. (2007) reviewed literature and concluded that combined lay and professional support were more effective in encouraging women to continue 'exclusive breastfeeding', compared with professional support alone. They used combined several methods including individual counselling and group education to provide better outcomes (Hannula, Kaunonen, & Tarkka, 2008). However, these professional supports in relation to breastfeeding information and technique need to be consistent. There are several studies that show that inconsistent or conflicting support and advice from health professionals has negative outcomes in breastfeeding (Nelson, 2007; Taveras, et al., 2003).

In Australia, several studies reported that the postpartum women felt they had insufficient support from health professionals, lack of information, and inconsistent information about breastfeeding between professionals, which were made the women confused (Gilmour, Hall, McIntyre, Gillies, & Harrison, 2009; James, 2004). A small Australian study (n = 59) showed that more than half of the women experienced inconsistent advice from health professionals (Stamp & Casanova, 2006). Gilmour et al. (2009) argued that the workload of midwives have increased that made them put under pressure to provide sufficient information not only about breastfeeding but also whole postnatal care. The timeframe for them during the

postpartum period is more intensive than before (Gilmour, et al., 2009). In an earlier study of 70 primipaorus Australian women, Duffy, Percival, and Kershaw (1997) found that the women who attended group sessions about positioning and attachment when breastfeeding infants provided by a lactation consultant significantly had a positive impact on 'any breastfeeding' at six weeks postpartum, compared with those who did not attend the sessions (91% vs. 29%). Likewise, the results from a pooled data analysis of 981 primiparous women in Australia showed that the women who received a home visit care from a midwife and who asked help of midwife when having breastfeeding problems after delivery were more likely to continue 'any breastfeeding' at six months postpartum, compared with those who did not received professionals' support (Forster, et al., 2006). However, several studies showed that professional support on breastfeeding were not associated with 'any breastfeeding' at six months postpartum (Forster et al., 2004; Hauck & Dimmock, 1994).

In Japan, similar results to the Australian studies were obtained from a National Survey (n = 46,569): that women who had professional advisors or peer support with child care were positively related to a longer duration of exclusive breastfeeding (adjusted OR = 0.95, 95% CI = 0.84-1.07 for professional advisors) (adjusted OR = 1.25, 95% CI = 1.14-1.37 for peer support) (Kaneko, et al., 2006). Nevertheless, health professionals often give inappropriate information about infant feedings and often have insufficient understanding of breastfeeding issues in Japan. A study of 151 midwives who attended an academic conference showed that more than 45% considered that the practice of teaching expectant mothers to prepare infant formula not to be an obstacle of breastfeeding and 32% stated that providing free gifts of infant formula would not impede breastfeeding practices (Awano, Sekizuka, Shimada, & Sakai, 2003). Infant formula is sometimes suggested by health professionals to relieve women from the stress and pressure of perceived insufficient breastmilk supply (Hattori, Horiuchi, Nunohara, & Taniguchi, 2006). Mizuno et al. (2006) also reported that paediatricians (n = 90) were more aware of the importance of breastmilk than obstetricians (n = 62) (66% vs. 13%) and knowledge about the 'WHO marketing code' was at a similar level (51% vs. 18%).

2.8.3.3 Breastfeeding education

Education is a powerful and an effective method to promote breastfeeding initiation and duration, and there are various types of breastfeeding education, for instance antenatal and postnatal class, coaching, guidelines, conferences, web-based learning, interactional education, and telephone counselling (Abbott, Renfrew, & McFadden, 2006). A cohort study of 1,155 women in rural northeast Scotland found that the initiation and duration of breastfeeding for pregnant women and breastfeeding women increased by having sessions of group-based and one-to-one peer coaching (Hoddinott & Britten, 2006). Kmietowicz (2000) stated that the use of discussion using small groups and one-to-one advice sessions would bring about better outcomes compared with distributing leaflets on the benefits of breastfeeding. The most important point is that all staff working in areas connected to breastfeeding should be well trained and must understand the principles and practice of breastfeeding support. The WHO stated that the medical professions should play an important role in assisting women in terms of providing breastfeeding education (World Health Organization, 2002).

2.8.3.4 Family smoking environment

Many studies have documented that paternal smoking reduced breastfeeding duration (Xu, et al., 2010). In some Asian countries, couples often live with other family members, particularly, their parents. Family smoking environment is also key factor for breastfeeding outcomes. The whole environment surrounding infants must be smoking free.

The Australia's smoking rate in male population, over 14 years of age has gradually decreased from 21.1% in 2001, to 18.7% in 2004, and further declined to 18.0% in 2007 (Australian Institute of Health and Welfare, 2011b). In 2010, this rate was to 16.4% and is predicted to decline to 14% by 2020 (Australian Institute of Health and Welfare, 2011b). The Australia Bureau of Statistics (ABS) showed that more than a third (37%) of children aged between 0 and 14 years lived with one or more regular smokers, of 10% of children with the same age lived with at least one regular smoker in the house (Australian Bureau of Statistics, 2006). While maternal smoking status and breastfeeding duration were negatively associated, there have been fewer studies that showed that paternal smoking status affected the duration of breastfeeding in

Australia. However, a cohort study (n = 992) in China, the results showed that the paternal smoking was 1.33 times more likely to cease 'exclusive breastfeeding before six months (95% CI = 1.09-1.64) than in their non-smoking counterparts (Xu, et al., 2010).

In 2009, the Japanese smoking rate in males was 38.2%, which was a decrease from 55.3% in 1989 but Japan still has a high rate in male smoking at international level (Ministery of Health Labour and Welfare, 2010). Therefore, Japanese women and their infants are commonly exposed to passive tobacco smoke (Kaneita et al., 2006). Kaneita et al. (2006) found that husbands' smoking status was associated with non-breastfeeding status by women (adjusted OR = 0.86, 95% CI = 0.82-0.90). A large cross-sectional study (n = 46,569) showed that the risk of ceasing breastfeeding by women was decreased when only their husbands were smokers, compared to non-smoking parents (adjusted OR = 0.92, 95% CI = 0.88-0.97) (Kaneko, et al., 2006).

2.8.3.5 Infant formula advertising

In 1981, the WHO announced the International Code of Marketing of Breastmilk Substitutes, which aimed to shield breastfeeding from commercial promotion and to ensure the proper use of infant formula (World Health Organization, 1981). However, many countries, including Japan still accept the distribution of free samples of infant formula to mothers at their discharge. Howard et al. (2000) reported that mothers who received 'gifts' from formula companies were more likely to cease breastfeeding within two weeks after birth than those who did not receive gifts. There are a few studies on this topic in relation to breastfeeding outcomes. An American cross-sectional study of 3,895 primiparous women showed that 66.8% women received a formula sample packet upon discharge and these were more likely to discontinue 'exclusive breastfeeding' at less than 10 weeks, compared to whose did not receive it (adjusted OR= 1.39, 95% CI = 1.05-1.84) (Rosenberg, Eastham, Kasehagen, & Sandoval, 2008). Kaplan and Graff (2008) suggested that each country needs to change the current environment at three levels; individual-, institutional and community-, and policy- in order to support, protect, and promote breastfeeding.

2.8.3.6 Pacifiers, artificial teat

Pacifiers known as dummies or soothers are widely used to calm infants (Binns & Scott, 2002b). While relationships between pacifiers use and breastfeeding outcomes are controversial, several studies reported that pacifiers are prone to shorten the duration of breastfeeding (Benis, 2002; Nelson, Yu, & Williams, 2005). A cohort study in Brazil with 500 children, found 60% of the infants used pacifiers within one month and the use of pacifier was identified as significant factor in the termination of 'exclusive breastfeeding' before six months of age (adjusted HR = 1.9, 95% CI = 1.5-2.4) (Cunha, Leite, & Machado, 2005). An American randomised clinical trial (RCT) (n = 700 infants) reported that early introduction of pacifier had a shorter duration of 'exclusive breastfeeding' at one month (OR = 1.5, 95% CI = 1.0-2.0, $p < 0.03$) and 'any breastfeeding' (HR = 1.2, 95% CI = 1.02-1.42, $p < 0.03$) (Howard et al., 2003). However, there are some studies which found no relationship between pacifier use and breastfeeding duration (Collins et al., 2004). From a systematic review of literature, O'Connor et al. (2009) concluded that pacifier use did not affect the duration of breastfeeding.

In Australia, a cohort study of 587 women in Western Australia found that the use of a pacifier to infants at two weeks postpartum increased discontinuation of breastfeeding for six months of life after adjusting confounders (n = 556, adjusted OR = 0.40, 95% CI = 0.25-0.63) (Binns & Scott, 2002b). Similarly, the results from a cohort study in Victoria (n = 298) showed that the women who introduced a pacifier before 19 days were associated with a shorter duration of breastfeeding (OR =0.49, $p < 0.05$). Scott et al. (2006) suggested that women should be disparaged an introduction of pacifier before 10 weeks.

In Japan, a use of pacifier all the time is not common (Nelson, et al., 2005). Therefore, there was dearth of studies relating to pacifier use and breastfeeding. A cross-sectional study investigating on the current situation of a pacifier use with 1,207 women who have children at 14 months or 30 month of age showed that 26.9% at 14 months and 11.1% at 30 months of age used pacifiers (Takada et al., 2006). The majority of women had no reason for the use of pacifiers but some used it to prevent thumb sucking in this study (Takada, et al., 2006).

Although pacifier use to infant is uncertainty in regard with breastfeeding duration, a positive relationship between pacifier use and the prevention of sudden infant death syndrome (SIDS) is found in recent years (Hauck, Omojokun, & Siadaty, 2005; Jenik, Vain, Gorestein, Jacobi, & Grp, 2009; Mitchell, Blair, & L'Hoir, 2006). Jenik et al. (2009) stated that pacifier use within 15 days after birth would not be influential factor for discontinuation of breastfeeding, rather, that the benefits of pacifier use including the reduced risk of SIDS needed to be focused, which are based on the results of their study while protective mechanism of SIDS by using pacifiers are not identified yet.

2.8.3.7 Prelacteal/early supplemental feeding

WHO and UNICEF encourage women to commence breastfeeding (colostrum feeding) within 30 minutes of birth (Saadeh & Akre, 1996). However, prelacteal feeding, which is to give infants glucose, plain water, or infant formula for their first feeds, is a common practice in some countries and in turn, the onset of lactogenesis II is often delayed (Dewey & Adu-Afarwuah, 2008). In China, prelacteal feeds were given to more than a quarter of infants instead of colostrum (Qiu, et al., 2007; Zhao, Niu, Xu, Garrett, & Greiner, 2003). One randomized controlled trail (RCT) found that prelacteal/early supplemental feeds was associated with shorter duration of breastfeeding (Martin-Calama et al., 1997), However, Becker (2011) argued that it was difficult to determine this association as prelacteal feeds were often used for medical reasons. There are a few studies that deal with this topic in relation to breastfeeding outcomes in Japan and Australia.

An Australian cohort study of 587 women investigated the association between prelacteal feeds and ‘full breastfeeding duration’ to six months or ‘any breastfeeding’ to 12 months postpartum (Scott, et al., 2006). However, the results of this study showed this association was not significant, suggesting that prelacteal feeds was given to infants for medical reasons in the most of the cases (Scott, et al., 2006).

On the other hand, prelacteal feeds/early supplemental feeding were commonly used in the in the Japanese neonatal care. A study of 41 obstetric facilities including hospitals and clinics in Okinawa prefecture (approximately 47% of the total number of the obstetric facilities) showed that only eight facilities (19.5%) routinely gave nothing to infants after birth except breastmilk from their own mothers. Nineteen

facilities (46.3%) gave infant formula or glucose to infants while in hospital and five facilities (12.1%) gave these immediately after birth (Nakamura, 2002). Many Japanese infants are not exclusively breastfed. The National report stated that 32.4% of 2,722 women commenced breastfeeding within 30 minutes of birth (Ministry of Health Labour and Welfare, 2007).

Chapter 3: Methodology

This chapter describes the methodology used in this study, the study design and location, the procedures used for the data collection, the data analysis, and storage, along with methods employed to ensure reliability of the data. In addition, this chapter explains the ethical considerations related to the study.

3.1 Study design, location, questionnaire, and data collection

To achieve the objectives, information was used from two separate studies focusing on postpartum women in two different cultural groups: Japan and Australia. These two studies used a similar questionnaire on infant feeding practices.

3.1.1 The Japanese infant feeding study

The Japanese study was a cross-sectional study undertaken between May and October in 2007 by the authors. The study questionnaire is described in details in the following sub-section. All women who met inclusion criteria (See section 3.2) were randomly recruited through the health check service of infants that the local governments provided. Japanese infants receive regular free health check services at three-four, 18 months, and three years of age. Almost 100% of infants will attend for these examinations. When Himeji City Health Department posted an invitation letter for the health check at 18-months of age, the women were asked to voluntarily participate in the study and complete an enclosed questionnaire. The questionnaire was returned on the day of the health check for their infants at local community centres. In total, 2,345 questionnaires were distributed during the study period.

3.1.1.1 The location of the study

This study was conducted in Himeji city in Hyogo prefecture where is located in the central part of Japan (see Figure 7). Hyogo prefecture has coastlines on two seas: to the south, the Inland, to the north, the Sea of Japan. Most of people in Hyogo prefecture live on the southern coast and the northern portion is sparsely populated. There are 29 cities and 8 districts and Himeji city is the second biggest city. In 2007,

Himeji city had a total estimated population of 536,000 including 10,000 foreign residents, and the birth rate was 9.8 per 1000 (Department of Information policy in Himeji-city, 2007).

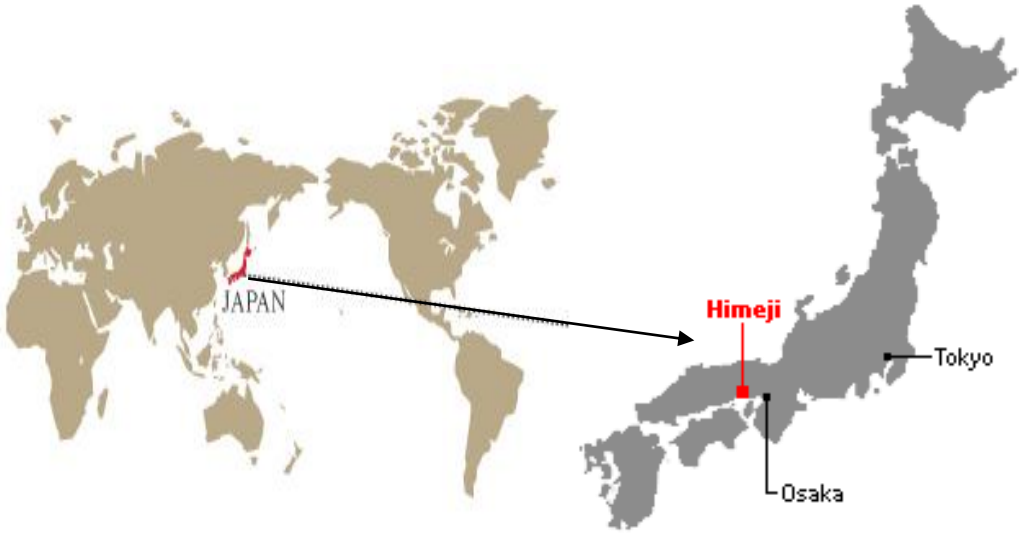


Figure 7: The map of Japan, the location of Himeji city

3.1.1.2 Study questionnaire

A structured, self-administered, and anonymous questionnaire was used to identify infant feeding practices and women's body image. Factors that are previously found to be associated with breastfeeding outcomes are included (see Appendix C).

- Demographic factors (e.g. maternal age, occupation, marital status, method of delivery, parity, family income, husbands'/partner's occupation, smoking status, alcohol intake during lactation, current weight status, pre-pregnancy weight status, maternal height, infants' birth weight)

- Infant feeding practices (e.g. intention of breastfeeding, expressing breastmilk, breastfeeding problems, the reasons for ceasing breastfeeding, starting time of solid food and infant formula)

- Psychosocial factors (e.g. attitudes and knowledge towards breastfeeding, family preferences of infant feeding methods, women's body image perceptions of weight return as their pre-pregnancy, and perceptions of breast shape changes as their pre-pregnancy)

The attitudes and knowledge towards infant feeding methods (psychosocial factor) was measured by the Iowa Infant Feeding Attitudes Scales (IIFAS) (De la Mora, Russell, Dungy, Losch, & Dusdieker, 1999). The IIFAS is a reliable and validated

measure with 17 items on an ascending scale of 1 = strong disagree to 5 = strong agree. Total scores could range from 17 to 85, with higher scores reflecting more positive or favourable attitudes towards breastfeeding. Scores between 49 and 69 were considered to reflect neutral attitudes towards infant feeding methods (De la Mora, et al., 1999).

Women's body image (psychosocial or cultural factor) was assessed by the Attention to the Body Shape Scale (ABS) (Beebe, 1995) and the short form of the Body Shape Scale Questionnaire (BSQ-8c) (Evans & Dolan, 1993). The ABS is a seven-item assessment tool containing statements about the individual perceptions on her own body shape and appearance. Each item rated on with a five-point Likert scale ranging from 1 = definitely disagree to 5 = definitely agree. In a recent study, a Japanese version of the ABS was verified for internal consistency (α = 0.70-0.80) (Kagawa, 2004). A value of Cronbach's alpha level presenting internal consistency above 0.7 indicates a high reliability, between 0.5 and 0.7 shows moderate, 0.2 to 0.4 is fair, and below 0.2 means a low reliability (Nunnally & Bernstein, 1994). The BSQ-8c,which has eight items with a six-point Likert scale ranging from 1 = Never to 6 = Always, and is a reliable instrument to assess people's concerns about body shape apart from their attitudes, behaviours, and mental health issues (Evans & Dolan, 1993). The BSQ-8c is also the best reflection of the original BSQ of 34 items among several short forms that have been developed (Pook, Tuschen-Caffier, & Brahler, 2008). The higher the points scored: the higher the level of consciousness about body shape. However, this study could use only five items (items: 1, 5, 6, 7, 8) out of eight in the BSQ-8c due to privacy issues raised by the City of Himeji.

Permissions to use the ABS and BSQ-8c obtained from the each author. Both were then translated into Japanese. The translation of our questionnaire was confirmed by two bilingual health professionals (medical doctor and midwife) and one accredited translator to improve the clarity. The final questionnaire was discussed in a focus group as a pilot study to check cultural appropriateness.

3.1.2 The Perth Infant Feeding Studies Mark II (PIFS II)

The PIFS II was a cohort study of 587 postpartum women undertaken at two urban public hospitals in Perth, Western Australia between 2002 and 2003 in order to provide data for the development of the guidelines for infant feeding in Australia

(Binns, Graham, Scott, & Oddy, 2005). The participants who agree to participate were asked to complete a self-administered questionnaire within the first three days after childbirth while still in hospital in order to obtain baseline information. Follow-up telephone interviews were held on a further seven occasions over a period of 12 months.

3.1.2.1 Study questionnaire

The questionnaire used in the PIFS II was almost the same as that used in the Japanese study, which has published elsewhere (Giglia, 2007). However, there were fewer questions related to women's body image. These included questions on the women's perceptions of effects of breastfeeding on their body weight status and their breast shape. These questions asked were 'what effect do you think breastfeeding has on your body weight?' and 'what effect do you think breastfeeding has on the shape or size of women's breast after she has stopped feeding?' The participants were asked these questions at four weeks and 52 weeks postpartum.

3.2 Inclusion and exclusion criteria

The common inclusion criteria of these studies were women, whose ages range from 16 to 50 years without major medical problems for themselves or their infants, and those who were willing to participate in this study. The participants were also born in either Australia or Japan. Japanese women were recruited at 18 months postpartum regardless of their experience in breastfeeding. Australian women were interviewed in the immediate postpartum periods when being recruited. The exclusion criteria were males, and women who did not fulfil the inclusion criteria.

3.3 Data analysis

Statistical Package for the Social Science (SPSS), version 18.0 (SPSS Inc., Chicago, IL, USA) was used for all statistical analysis. Descriptive statistics was first employed to describe the distribution of the data. While independent t test used for continuous variables including the total score of IIFAS, ABS, and the alternate form of BSQ-8c, chi-squared test or Fisher's exact test were performed to compare

between categorical variables. In the Australian study, a Cox logistic regression was applied to model the time-to-event data and to determine which variables predicted the duration of breastfeeding. The effects of women's perceptions of changes in their breast shape at 4 and 52 weeks postpartum onto the duration of breastfeeding were analysed using multiple logistic regression. In the Japanese study, binary logistic regression was also applied to variables which might have an influence on the 'any breastfeeding' for six months postpartum. In binary logistic regression, the score of the IIFAS, ABS and BSQ-8c were entered into the model as continuous variables and other potential risk variables as categorical variables. Two-sided test with a p value < 0.05 were considered to indicate statistical significance ($p < 0.05$). Odds Ratios (OR) and 95% Confidence Intervals (CI) were also calculated.

3.4 Ethical consideration

The PIFS II was approved by the research ethics committees of the two participating hospitals in Australia and by the Human Research Ethics Committee of Curtin University (Binns, et al., 2005). All postpartum women were given an information sheet about the study and those willing to participate gave their signed informed consent before completing the questionnaires. The participants were able to withdraw from the study at any time without penalty and prejudice.

For the Japanese study, ethical approval was obtained from the Human Research Ethics Committee of Curtin University (see Appendix A) and the Research Ethics Committee in Himeji Central Public Health Centre. A written information sheet (see Appendix B) explaining the purpose of our study was provided to all eligible women before commencement of the study. Their consent was implied if they returned the questionnaire.

In both studies, confidentiality and anonymity of the data obtained from the participants was assured by having an ID code in each questionnaire and a password when accessing the data in computer files. The questionnaires used in this study and the computer disc containing the data were stored in a locked cupboard in the researcher's office for five years in accordance with National Health and Medical

Research Council (NHMRC) guidelines. All results from this study were reported as group findings in the scientific literature.

Chapter 4: Results

This chapter is divided into three parts:

1) The Japanese infant feeding study
2) The Australian infant feeding study (PIFS II), and
3) Comparisons of infant feeding practices between Australia and Japan.

The first part of this chapter documents the infant feeding practices in Japan. This is followed by details of the knowledge and attitudes towards breastfeeding. The postpartum women's body image including their perceptions of breast shape changes then reported. The second part details findings on infant feeding practices from the PIFS II study. The final part shows the differences of infant feeding practices between Japan and Australia. The results from the both studies include both univariate and multivariate analyse.

Part 1: The Japanese infant feeding study

A cross-sectional study using a questionnaire about infant feeding practices and postpartum women's body image was undertaken in Himeji city, Japan. The questionnaire was distributed to 2,345 women at 18 months postpartum. Overall 1,623 returned the questionnaire (response rate = 69.2%) and 1,612 were used for statistical analysis after excluding the questionnaires with missing answers.

4.1 Descriptive results of demographic and breastfeeding factors

Table 7 presents the descriptive results of the respondents. The largest group was aged between 30 and 34 years old, making up nearly 45% of the sample. More than two thirds were in their 30s when respondents aged over 35 years old were included. The average age was 32 years, with a range of 18 to 45 years. Moreover, just below half (44%) were new mothers and the majority (94.6%) were legally married. The divorce/separation rate was 1.9%. Although the majority of women (71.4%) were unemployed, almost all of their husbands (91.2%) were employed, either full or part-time. Nearly 60% of their husbands held non-professional work. Approximately 7% did not answer the husbands' employment status, reflecting either privacy concerns or perhaps the respondents were unaware of their husbands' exact employment. Nevertheless, people living in this area generally had a stable financial status. The

most common delivery method was by vaginal delivery with 85.0%, with nearly 15% of the infants delivered by caesarean section. The male/female ratio at birth was 0.99. The rate of low birth weight infants (less than 2500g) was 8.4%. The highest percentage of annual family income was in the group between 2,500,001 and 4,500,000 yen with 37.8% (equivalent value in AU$ to, approximately between 27500 and 50000), following the group between JP¥ 4,500,001 and JP¥ 6,500,000 (equivalent value in AU$, approximately between 50000 and 72000).

Table 7: Demographic characteristics of respondents (n = 1,612)

		n	%
Respondents' age (years)			
	< 25	67	4.2
	25-29	351	21.8
	30-34	722	44.8
	35 +	411	25.5
	No response	61	3.8
Parity			
	Primipara	708	44.0
	Multipara	899	55.7
	No response	5	0.3
Occupation			
	Self-employed	29	1.8
	Professional work	91	5.8
	Non-professional work	302	18.6
	Home duties	1151	71.4
	No response	39	2.4
Husband's occupation			
	Self-employed	184	11.4
	Professional work	352	21.8
	Non-professional work	956	59.3
	No response	120	7.4
Delivery methods			
	Vaginal	1370	85.0
	Caesarean section	240	14.9
	No response	2	0.1
Birth weight of infants			
	< 2500g	135	8.4
	≧ 2500g	1368	84.9
	No response	109	6.8
Annual family income (yen)			
	Below 2,500,000	219	13.6
	2,500,001-4,500,000	609	37.8
	4,500,001-6,500,000	413	25.6
	6,500,001-8,500,000	179	11.1
	Above 8,500,001	74	4.6
	No response	118	7.3

The respondents were also asked a series of questions related to their attitudes and practices towards breastfeeding. Table 8 shows that the number of mothers who decided on their infant feeding methods before they became pregnant (39.4%) and after baby was born (40.2%) were approximately the same. About 12% decided in the early pregnancy but only in a few did so late pregnancy and during delivery.

Table 8: The time when first decided how to feed their infants

	n	%
Before pregnancy	635	39.4
Early pregnancy	188	11.7
Late pregnancy	98	6.1
During labour	35	2.2
After baby was born	648	40.2
No response	8	0.5
Total	1612	100.0

Table 9 presents the reasons for breastfeeding given by the respondents who undertook breastfeeding. In total, 87.3% gave positive responses about breastfeeding. Approximately 35% for its nutritional value, 24.9% economic advantage, 16.2% convenience and 10.1% also stated that they could lose weight by breastfeeding.

Table 9: The reasons to breastfeed their infants (multiple responses)

	n	%
Breastmilk better for infants	950	35.4
Breastfeeding right thing to do	57	2.1
Breastfeeding is cheaper	667	24.9
Breastfeed babies are more intelligent	43	1.6
Breastfeeding helps weight loss	272	10.1
Breastfeeding is fashionable	10	0.4
Breastfeeding prevents allergies for infants	226	8.4
Breastfeeding is more convenient	435	16.2
Other reasons	23	0.8
Total	2683	100.0

In contrast, Table 10 presents the reasons not to breastfeed their infants provided by the respondents who used only infant formula feeding. A smaller percentage (12.5%) gave answers less favourable to breastfeeding. Over half (51.2%) stated insufficient production of breastmilk and a further 12.5% responded that it allowed them to know exactly the amount of milk that their infants got at each feeding. Also

7.5% believed that infant formula was as good as breastmilk. A small number, 3.3% answered that health professionals including medical doctors, midwives, or registered nurses recommended formula feeding.

Table 10: The reasons not to breastfeed their infants (multiple responses)

	n	%
Formula is better	6	0.8
Bottle feeding is easier	41	5.7
I dislike breast feeding	7	1.0
Back to work soon after birth	25	3.5
Breastfeeding make my breasts sag	7	1.0
My husband prefers bottle feeding	5	0.7
Formula is just as good as breastmilk	54	7.5
My husband can help with bottle feeding	50	6.9
I want to know how much milk at each feed	90	12.5
I want to continue smoking	14	1.9
I play a lot of sport	2	0.3
Breastfeeding is too embarrassing	4	0.6
My mother suggested bottle feeding	6	0.8
Friend/relative suggested bottle feeding	3	0.4
Health professionals suggested bottle feeding	24	3.3
Insufficient breastmilk	369	51.2
Other reasons	14	1.9
Total	721	100.0

Table 11 shows that nearly 70% of the respondents had experiences of breastmilk expression. If they had expressed breastmilk they were asked about the main methods they used (see Table 12). The majority manually expressed their breastmilk either the use of their hands (58.5%) or pumps (30.6%). Using electrical pumps was not common in Japan.

Table 11: Experiences of expressing breastmilk

	n	%
Yes	1123	69.3
No	484	30.0
No response	5	0.3
Total	1,612	100.0

Table 12: Main method of expressing breastmilk (If say 'yes' in Table 11)

	n	%
By hand	656	58.5
Manual pump	343	30.6
Electric pump	123	10.9
No response	1	0.1
Total	1,123	100.0

While more than half (57.4%) stated that they had no problems when expressing their breastmilk, 38% experienced problems (Table 13). They felt that expressing breastmilk consumed a lot of time (27.9%) and almost the same percentage obtained a small amount of breastmilk by expression (Table 14). Expressing breastmilk was generally time-consuming for them. Nearly 30% had more than one problem with expressing breastmilk.

Table 13: Problems addressed by women when expressing breastmilk

	n	%
Yes	612	38.0
No	926	57.4
No response	74	4.6
Total	1,612	100.0

Table 14: Types of problems in expressing breastmilk (If say 'yes' in Table 13)

	n	%
Time consuming	171	27.9
Breast pain	94	15.4
Insufficient milk obtained by expressing	163	26.6
Time consuming and breast pain	68	11.1
Breast pain and insufficient milk	71	11.6
Time consuming and insufficient milk	42	6.9
Mother's tiredness	1	0.2
Time consuming for preparation	2	0.3
Total	612	100.0

Table 15 showed that approximately 62% faced breastfeeding difficulties. The most common problems were perceived 'insufficient milk flow' by 25.4% (Table 16). 'Cracked or sore nipples' were also identified by 21.4% and nearly 10% felt pain in breast. 5.5% felt 'less confidence towards breastfeeding'.

Table 15: Frequency of respondents experiencing breastfeeding problems

	n	%
Yes	998	61.9
No	606	37.6
No response	8	0.5
Total	1,612	100.0

Table 16: Types of breastfeeding problems experienced (multiple responses)

	N	%
Cracked or sore nipples	422	21.4
Breast engorgement	68	3.5
Breast infection	210	10.7
Inverted nipples	102	5.2
Breastfeeding is painful	192	9.7
Inadequate weight gain	104	5.3
Infant has troubles in sucking	91	4.6
Infant gets too much breastmilk	87	4.4
Takes long time for milk flow (poor let-down)	19	1.0
Infant does not like breastmilk	44	2.2
Infants was too tired to feed	20	1.0
Feelings that I am not doing very well	109	5.5
Not enough breastmilk supply for infant	501	25.4
Others	2	0.1
Total	1971	100.0

The respondents' families were generally not positively supportive of breastfeeding, but really did not express an opinion (see Figure 8). More than half stated 'the family did not mind about the infant feeding method' (their husbands = 64.8%; own mothers = 54.5%). About 14% had had no discussion on this matter with their husbands, while only 18.9% stated that their husbands preferred breastfeeding.

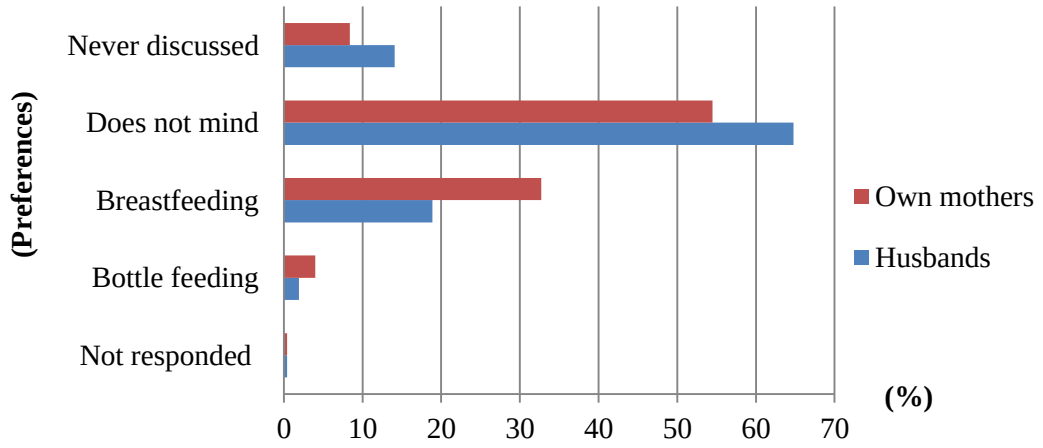


Figure 8: The family (respondents' husbands and their own mothers) preferences towards infant feeding methods (n = 1,612)

The respondents were asked about their own mothers' experience of breastfeeding (Table 17). More than half (53.7%) stated that their own mothers did not have the experience of breastfeeding their infants. Approximately 16% did not even know if they were breastfed or not.

Table 17: Experiences of breastfeeding among maternal mothers' (grandmothers of infants)

	n	%
Yes	478	29.7
No	866	53.7
Do not know	260	16.1
No response	8	0.5
Total	1,612	100.0

With regards of the close friends' experiences of breastfeeding, more than half (55.1%) stated that the friends used both, breastmilk and infant formula (Table 18).

Table 18: Distribution of infant feeding methods of respondents' close friends

	n	%
Mostly bottle	130	8.1
Mostly breastfeeding	470	29.2
Bottle feeding and breastfeeding	899	55.1
Friends do not have infants	26	1.6
I do not know	95	5.9
No response	2	0.1
Total	1,612	100.0

Table 19 presents the first food given to infants while in hospitals described by the mothers. While approximately 44% reported that the infants had breastmilk as their first food after birth, infant formula and glucose water were given to nearly 30% and 20% of infants respectively. More than 6% answered that they did not know what the infants first had been fed in hospital.

Table 19: The first food for infants had at the hospitals after birth

	n	%
Infant formula	480	29.8
Breastmilk	704	43.7
Sugar water/water (including glucose water)	315	19.5
Do not know	107	6.6
No response	6	0.4
Total	1,612	100.0

The mean duration of 'any breastfeeding' was approximately nine months in this study (see Table 20). The mean age of starting infant formula was 2.8 weeks, which meant that the majority had 'any breastfeeding' after their discharge from hospitals. More than 20% introduced infant formula within seven days after birth and this reached to almost 80% at two weeks postpartum. At four weeks postpartum, almost 88% used infant formula (see Figure 9). The mean age for starting solid foods was about six months.

Table 20: The breastfeeding practices by Japanese postpartum women

	n (No response)	Mean	SD
Duration of 'any breastfeeding' (in months)	1,606 (6)	9.12	6.42
The time when first introducing infant formula (in weeks)	1,278 (334*)	2.80	6.13
The age of the infants first had solid foods (in months)	1,617 (5)	5.47	1.13

*Including mothers not giving formula at all

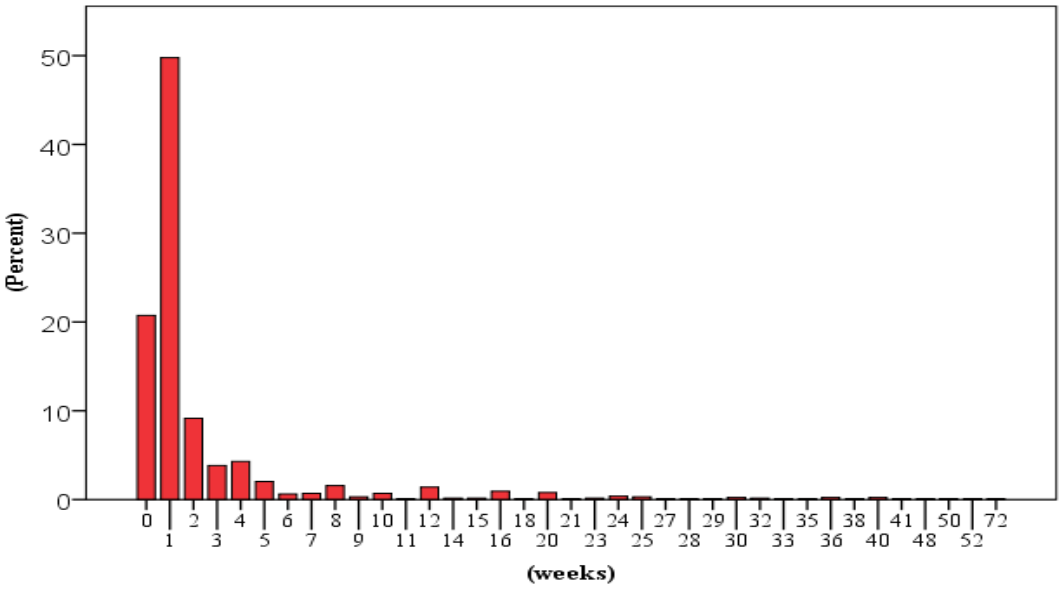


Figure 9: Starting time (weeks) of infant formula reported by respondents (n = 1,278)

Maternal smoking status during breastfeeding is shown in Table 21. The majority (86.2%) did not smoke during breastfeeding, but 10.6% continued smoking. Only 1.3% stated that they stopped smoking during breastfeeding. Among the smoking women, the highest proportion (5.4%) smoked between half pack to one pack (20 cigarettes) daily on average (Table 22).

Table 21: Respondents' smoking status during breastfeeding

	n	%
Yes	171	10.6
Yes, but quit during breastfeeding	21	1.3
No	1390	86.2
No response	30	1.9
Total	1,612	100.0

Table 22: Average consumption level of cigarettes per day (If say 'yes' in Table 21)

	n	%
Less than 5	16	1.0
5-9	45	2.8
10-19	87	5.4
20 -29	32	2.0
30-39	5	0.3
No response	7	88.4
Total	192	100.0

Table 23 shows the smoking rate in other family member at 48.4%, which was much higher than for the mothers; see Table 21. The majority who smoked at home as stated by the respondents, were the fathers of the infants (87.0%) (Table 24). Some families in Japan still live in extended families, which may also include grandparents and other relatives.

Table 23: Smoking status by other family members

	n	%
Yes	786	48.4
No	712	44.2
No response	114	7.1
Total	1,612	100.0

Table 24: Who smokes at home (If say 'yes' in Table 23)

	n	%
Baby's father	684	87.0
Other family member	31	3.9
Baby's father and other family member	71	9.0
Total	786	100.0

Table 25 identifies the distribution of alcohol consumption during breastfeeding reported by respondents. While approximately 14% drank alcohol during

breastfeeding, more than 85% did not. Among them who drank alcohol during breastfeeding, about 40% drink alcohols as appetizers or with meals (Table 26). Some of them (26.8%) had no regular time for drinking, although they breastfed their infants. This study did not investigate the amount of alcohol intake by respondents or the specific type of liquor.

Table 25: Alcohol intake during breastfeeding by the Japanese respondents

	n	%
Yes	228	14.1
No	1374	85.2
No response	10	0.6
Total	1,612	100.0

Table 26: When alcohol was consumed during breastfeeding (If say 'yes' in Table 25)

	n	%
Before breastfeeding	8	3.5
Just after breastfeeding	41	18.0
Between breastfeeds	24	10.5
No particular time	61	26.8
Before/with dinner	94	41.2
Total	228	100.0

The most common reason for ceasing breastfeeding given by the respondents was their perceptions of insufficient breastmilk by 20.4%. While they satisfied themselves about the duration of breastfeeding (11.0%), they also believed that their infants had grown big enough (5.9%). Some women answered that their infants lost interest in breastfeeding (14.3%). About 9% still continued breastfeeding at 18 months after birth. Postpartum women also accepted that breastfeeding was physical or mental fatigue (9.0%). Over 5% gave this reason as infant started solid foods.

4.2 Knowledge and attitudes towards infant feeding methods

The Iowa Infant feeding Attitudes Scales (IIFAS), a reliable and validated measure, was used to assess maternal knowledge and attitudes towards infant feeding methods (De la Mora, et al., 1999). Overall 1586 valid questionnaires were used in the analysis and the responses were regrouped from five to three point scales: 1 = Agree, 2 = Neutral, and 3 = Disagree. The average score of the IIFAS was 54.2 (SD = 4.9),

which was in the 'neutral' range, however, this sample were more favourable to formula feeding. Table 27 presents the item distribution of the IIFAS.

Table 27: Knowledge and attitudes towards breastfeeding using the IIFAS (n = 1,612)

Item	Agree (%)	Neutral (%)	Disagree (%)
1. The nutritional benefit of breastmilk last only until the baby is weaned from breastmilk	42.3	27.9	29.8
2. Formula feeding is more convenient than breastfeeding	30.6	26.2	43.2
3. Breastfeeding increases mother-infant bonding	84.9	12.1	3.0
4. Breastmilk is lacking in iron	28.7	41.0	30.3
5. Formula-fed babies are more likely to be overfed than breastfed babies	42.1	37.6	20.3
6. Formula feeding is the better choice if mother plans to work outside the home	72.7	19.9	7.9
7. Mothers who formula feed miss one of the joys of motherhood	22.4	22.2	55.4
8. Women should not breastfeed in public places such as restaurants	33.4	22.9	43.8
9. Breast fed babies are healthier than formula fed babies	35.1	36.3	28.6
10. Breast fed babies are more likely to be overfed than formula fed babies	11.3	46.9	41.8
11. Father feels left out if mother breast feeds	15.2	28.9	56.0
12. Breastmilk is the ideal food for infants	89.8	8.6	1.6
13. Breastmilk is more easily digested than formula	62.6	33.8	3.6
14. Formula is as healthy for an infant as breastmilk	58.1	31	10.9
15. Breastfeeding is more convenient than formula feeding	9.4	26.5	64.1
16. Breastfeeding is less expensive than formula	94.8	3.6	1.6
17. A mother who occasionally drinks alcohol should not breastfeed her baby	63.3	24.1	12.6

Note: The items 1, 2, 4, 6, 8, 10, 11, 14, and 17 were reversed when calculating the score

- Disagree includes 'strongly disagree' and 'disagree'
- Agree includes 'strongly agree' and 'agree'

The majority (94.8%) answered that breastmilk was less expensive than formula and 84.9% believed that breastfeeding promoted mother-child bonding. 89.8% also thought that breastfeeding was the ideal food for infants, while over 70% agreed that formula was a better choice for working mothers. However, nearly 65% disagreed that breastfeeding was more convenient than formula. In a reverse question, 30% of them still agreed that formula feeding was more convenient than breastfeeding.

While more than half (55.4%) disagreed that mothers who use formula lack one of the joys of motherhood, the nearly same percentage stated that breastfeeding makes the father feel left out. Just 35% considered that breastfed infants were healthier than formula fed ones. While 44% disagreed that breastfeeding was not acceptable in public places, approximately 55% either agreed or were neutral on this question. More than 60% of the mothers also did not allow breastfeeding in mothers who occasionally drank alcohol. The Cronbach alpha level, indicating reliability of the measurement, in this study was 0.46.

In summary, the main features of the demographic and breastfeeding practices included the following. Japanese women had little support from their families during the postpartum period when commonly the decision on feeding methods for their infant was made. They relied heavily on infant formula as the answer to perceived insufficient production of their breastmilk. Some of them did not know the first food that had been given to their infants while in hospital.

The average score of the IIFAS was in the neutral range, the scores in this study were more likely to be positive towards infant formula feeding. In addition, many respondents and their infants were exposed to passive smoke because of the high rate of their husbands' smoking. These factors will be included in the multivariate analyses presenting in subsequent sections.

4.3 Relationship between risk factors and breastfeeding duration

Table 28 compares the sample demographics between two groups; 1) breastfeeding for less than six months of life, and 2) breastfeeding for more than six months of life. These two groups were significantly different in maternal age, parity, maternal employment status, husbands' employment, birth weight of infants, and family annual income, but were not significant in marital status ($\chi^2 = 2.457$, df = 1, p = 0.117), delivery methods ($\chi^2 = 0.956$, df = 1, p = 0.328), and gender of the youngest child ($\chi^2 = 2.648$, df = 1, p = 0.104).

Table28: 'Any breastfeeding' duration for six months of life by sample demographics

	Any breastfeeding duration		P value
	< 6 months	6months ≤	
	n (%)	n (%)	
Mother's age (years)			
< 25	45 (68.2)	21 (31.8)	0.000
25-29	156 (44.7)	193 (55.3)	$\chi^2 = 38.453$
30-34	248 (34.4)	473 (65.6)	df = 3
35 +	141 (34.3)	270 (65.7)	
Parity			0.002
primipara	239 (33.9)	466 (66.1)	$\chi^2 = 9.512$
multipara	370 (41.3)	526 (58.7)	df = 1
Occupation			
Self-employed	11 (37.9)	18 (62.1)	0.004
Professional work	36 (39.6)	55 (60.4)	$\chi^2 = 13.270$
Non-professional work	143 (47.4)	159 (52.6)	df = 3
Home duties	412 (35.9)	735 (64.1)	
Husbands' occupation			
Self-employed	83 (46.6)	95 (53.4)	
Professional work	113 (32.1)	239 (67.9)	0.004*
Non-professional work	363 (38.1)	590 (61.9)	FET = 12.837
Home duties	4 (66.7)	2 (33.3)	
Birth weight			0.002
< 2500g	65 (50.4)	64 (49.6)	$\chi^2 = 9.298$
2500g ≥	504 (36.8)	867 (63.2)	df = 1
Family annual income (yen)			
< 2,500,000	112 (51.1)	107 (48.9)	
2,500,001-4,500,000	258 (42.6)	348 (57.4)	0.000
4,500,001-6,500,000	131 (31.7)	282 (68.3)	$\chi^2 = 44.573$
6,500,001-8,5000,000	42 (23.5)	137 (76.5)	df = 4
8,5000,001 <	26 (35.1)	48 (64.9)	

*FET= Fisher's exact test

Table 29 presents the factors related to breastfeeding practices by the duration of breastfeeding. The respondents who decided about the infant feeding methods at before or early in their pregnancy tended to have a longer duration of breastfeeding, compared to those who decided after delivery. The respondents who had expressed breastmilk, but those who did not have problems during breastfeeding had a longer duration of breastfeeding than their counterparts. Breastfeeding for less than six months postpartum was associated with groups of the respondents who smoked during breastfeeding. Those who ceased smoking temporarily during breastfeeding also had a shorter duration of breastfeeding. The respondents who had a family

member with smoking (55.4%) were more likely to breastfeed for less than six months of life. It is interesting to note that nearly 70% who drank alcohol during lactation had a duration of 'any breastfeeding' above six months of life (p = 0.009). Breastfeeding for more than six months of life was more likely in the group of the mothers whose infants were fed breastmilk while in hospitals as their first food. There were also statistically significant differences in terms of the introducing time of infant formula (p = 0.000), solid food (p = 0.000), and the total score of the IIFAS (p = 0.000).

Table29: Other factors associated with the duration of 'any breastfeeding' for six months of life

	Any breastfeeding duration		**p value**
	< 6 months	**6months ≤**	
	n (%)	**n (%)**	
Decision time of infant feeding methods			
Before pregnancy	163 (25.7)	471 (74.3)	
Early pregnancy	59 (31.4)	129 (68.6)	0.000
Late pregnancy	37 (37.8)	61 (62.2)	$\chi^2 = 97.182$
During labour	17 (48.6)	18 (51.4)	df = 4
After baby born	334 (51.7)	312 (48.3)	
Experience of expressing breastmilk			0.000
Yes	468 (41.7)	653 (58.3)	$\chi^2 = 20.854$
No	143 (29.7)	339 (70.3)	df = 1
Breastfeeding problems			
Yes	448 (45.0)	547 (55.0)	0.000
No	161 (26.6)	445 (73.4)	$\chi^2 = 54.438$ df = 1
Maternal smoking during breastfeeding			
Yes	114 (67.5)	55 (32.5)	0.000
Yes, but quit during breastfeeding	12 (57.1)	9 (42.9)	$\chi^2 = 72.860$
No	478 (34.4)	911 (65.6)	df = 2
Smoking of other family member			0.000
Yes	349 (44.6)	434 (55.4)	$\chi^2 = 22.555$
No	232 (32.6)	480 (67.4)	df = 1
Alcohol intake during breastfeeding			0.009
Yes	69 (30.3)	159 (69.7)	$\chi^2 = 6.902$
No	540 (39.4)	831 (60.6)	df = 1
Husbands' preference of infant feeding methods			
Bottle feeding	11 (36.7)	19 (63.3)	0.000
Breastfeeding	81 (26.6)	223 (73.4)	$\chi^2 = 22.226$
Do not mind	433 (41.6)	609 (58.4)	df = 3
Never discuss	88 (38.9)	138 (61.1)	

Own mothers' preference of infant feeding methods			
Bottle feeding	20 (31.3)	44 (68.8)	0.005
Breastfeeding	172 (32.7)	354 (67.3)	$\chi^2 = 12.799$
Do not mind	365 (41.7)	511 (58.3)	df = 3
Never discuss	55 (40.4)	81 (59.6)	
Own mothers' experience of breastfeeding			
Yes	154 (32.3)	323 (67.7)	0.000
No	327 (37.9)	536 (62.1)	$\chi^2 = 20.520$
Not known	128 (49.2)	132 (50.8)	df = 2
The first food given to infants while in hospitals			
Infant formula	213 (44.7)	264 (55.3)	0.000
Breastmilk	214 (30.4)	490 (69.6)	$\chi^2 = 32.713$
Sugar/Glucose water	134 (42.5)	181 (57.5)	df=3
Not known	50 (47.2)	56 (52.8)	
Introducing time of infant formula	-	-	0.000*
Introducing time of solid food	-	-	0.000*
The average score of the IIFAS	-	-	0.000*

*Mann-Whitney U test

Table 30 presents the factors affecting breastfeeding duration for six months of life with crude Odds Ratio (OR) from univariate analysis in relation to the reference group by demographic and breastfeeding factors. Significant factors associated with breastfeeding duration to six month postpartum from binary logistic regression with adjusted OR are also presented in the Table 30.

Three factors that were statistically significant in univariate analysis, 'the age of infants first had solid food' and 'husbands preference towards infant feeding method' and the 'mothers own mothers' preference towards infant feeding method' were not significant in the multivariate model.

'Any breastfeeding' for more than six months was more likely to be women who had higher IIFAS score (adjusted OR = 1.05, 95% CI = 1.02-1.08, p = 0.003), had late introduction of infant formula (adjusted OR = 1.05, 95% CI = 1.02-1.08, p = 0.003), primiparous women (adjusted OR = 2.33, 95% CI = 1.70-3.17, p = 0.000), and had annual family income between JP¥ 6,500,001 and JP¥ 8,500,000 (adjusted OR = 2.09, 95% CI = 1.01-4.31, p = 0.047).

Factors that were positively associated with breastfeeding duration in the multivariate analysis included women who made 'decisions about infant feeding

methods during pregnancy' and their infants who were fed breastmilk as the first food while in hospitals. It is interesting to note that the women who drank alcohol during breastfeeding were also associated with longer duration of breastfeeding (adjusted OR = 1.72, 95% CI = 1.12-2.65, p = 0.008). In contrast, the respondents who were younger, were employed (except self-employed), were smokers during breastfeeding, who had breastfeeding problems, who had family members who smoked in the house and whose infants with low birth weight tended to discontinue breastfeeding before six months postpartum.

Table 30: Significant factors affecting 'any breastfeeding' to six months postpartum (n = 1,612)

Factors	Crude OR (95% CI)	Adjusted OR (95% CI)
IIFAS scale score*	**1.07 (1.05-1.10)**	**1.05 (1.02-1.08)**
The age of infants first had infant formula (weeks)*	**1.06 (1.04-1.09)**	**1.05 (1.02-1.08)**
The age of infants first had solids foods (months)*	**1.21(1.10-1.33)**	1.03 (0.90-1.18)
Maternal age (years)		
< 25	**0.24 (0.14-0.43)**	**0.33 (0.13-0.79)**
25-29	**0.65 (0.48-0.87)**	0.68 (0.44-1.04)
30-34	1.00 (0.77-1.29)	0.95 (0.66-1.35)
35 +	1.00 (reference)	1.00 (reference)
Parity		
Primipara	**1.37 (1.12-1.68)**	**2.33 (1.70-3.17)**
Multipara	1.00 (reference)	1.00 (reference)
Delivery methods		
Vaginal	1.15 (0.87-1.52)	1.10 (0.72-1.68)
C-section	1.00 (reference)	1.00 (reference)
Marital Status		
Marriage	1.57 (0.89-2.78)	0.32 (0.02-4.88)
Not marriage	1.00 (reference)	1.00 (reference)
Maternal occupation		
Self-employed	0.92 (0.43-1.96)	1.42 (0.45-4.53)
Professional work	0.86 (0.55-1.33)	**0.36 (0.19-0.66)**
Non-professional work	0.62 (0.48-0.81)	**0.64 (0.44-0.92)**
House duties	1.00 (reference)	1.00 (reference)
Husbands' occupation		
Self-employed and others	1.00 (reference)	1.00 (reference)
Professional work	**1.90 (1.32-2.74)**	**1.88 (1.10-3.20)**
Non-professional work	**1.46 (1.06-2.00)**	1.60 (0.99-2.58)
Gender of the youngest child		
Male	0.85 (0.69-1.04)	0.99 (0.75-1.32)
Female	1.00 (reference)	1.00 (reference)
Experiences about expressing of breastmilk		
Yes	**0.59 (0.47-0.74)**	0.77 (0.56-1.09)
No	1.00 (reference)	1.00 (reference)

Time of deciding infant feeding methods		
Before pregnancy	**3.09 (2.44-3.92)**	**1.91 (1.37-2.65)**
Early pregnancy	**2.34 (1.66-3.30)**	1.55 (0.97-2.48)
Late pregnancy	**1.77 (1.14-2.73)**	**1.99 (1.08-3.67)**
During labour	1.13 (0.57-2.24)	1.05 (0.41-2.71)
After delivery	1.00 (reference)	1.00 (reference)
Breastfeeding problems		
Yes	**0.44 (0.36-0.55)**	**0.42 (0.31-0.57)**
No	1.00 (reference)	1.00 (reference)
Husbands' preference of feeding methods		
Bottle feeding (Infant formula)	1.10 (0.50-2.43)	0.53 (0.16-1.75)
Breastfeeding	**1.76 (1.21-2.54)**	1.32 (0.77-2.28)
Do not mind	0.90 (0.67-1.20)	0.92 (0.59-1.44)
Never discuss	1.00 (reference)	1.00 (reference)
Own mothers' preference of feeding methods		
Bottle feeding (Infant formula)	1.49 (0.80-2.80)	1.48 (0.62-3.52)
Breastfeeding	1.40 (0.95-2.06)	0.86 (0.48-1.54)
Do not mind	0.95 (0.66-1.73)	0.84 (0.48-1.48)
Never discuss	1.00 (reference)	1.00 (reference)
The first food given to infants while in hospitals		
Infant formula	1.11 (0.73-1.69)	1.76 (0.94-3.31)
Breastmilk	**2.04 (1.35-3.09)**	**2.30 (1.22-4.31)**
Sugar/glucose water	1.21 (0.78-1.88)	1.78 (0.93-3.43)
Not known	1.00 (reference)	1.00 (reference)
Maternal smoking status		
Yes	**0.25 (0.18-0.36)**	**0.38 (0.23-0.63)**
Yes but quit during breastfeeding	**0.39 (0.17-0.94)**	**0.21 (0.05-0.85)**
No	1.00 (reference)	1.00 (reference)
Family smoking status		
Yes	**0.60 (0.49-0.74)**	0.87 (0.65-1.16)
No	1.00 (reference)	1.00 (reference)
Alcohol intake during breastfeeding		
Yes	**1.50 (1.11-2.03)**	**1.72 (1.12-2.65)**
No	1.00 (reference)	1.00 (reference)
Infants' birth weight		
<2500g	**0.57(0.40-0.82)**	0.71 (0.44-1.15)
≥2500g	1.00 (reference)	1.00 (reference)
Family annual income (yen)		
<2,500,000	**0.52 (0.30-0.89)**	0.85 (0.40-1.79)
2,500,000-4,500,000	0.73 (0.44-1.21)	0.93 (0.48-1.80)
4,500,001-6,500,000	1.17 (0.69-1.96)	1.05 (0.54-2.04)
6,500,001-8,500,000	1.77 (0.98-3.19)	**2.09 (1.01-4.31)**
8,500,001<	1.00 (reference)	1.00 (reference)

- *Continuous variables
- -2 Log likelihood of multivariate analysis = 1170.030

4.4 Japanese postpartum women's body image at 18 months postpartum

4.4.1 Descriptions about postpartum mothers' body and breast shape

The questionnaire also included the postpartum women's perceptions of their body size and shape. Table 31 shows additional sample characteristics in relation to maternal Body Mass Index (BMI). More than half (66.1%) were in the 'normal' range of BMI (18.5-24.9) throughout their first pregnancy to 18 months postpartum. The proportion of the respondents who were in 'underweight' (BMI < 18.5) before the first pregnancy was 23.9% and this rate decreased to 17.8% at 18 months postpartum. In the group of the respondents who were pregnant for a second time, the pre-pregnancy underweight rate was further reduced to 11.3%. There was small number of the women classified as 'obesity' (25 ≤ BMI). (Note this is the Japanese definition where 25 ≤ BMI is regarded as 'obesity' instead of 'overweight') However, 8% did not respond to these questions, which might be related to the personal nature of the question.

Table31: Sample characteristics related to their body size (n = 1,612)

	n	%
Respondents' BMI at 18 month postpartum		
< 18.5	287	17.8
18.5-24.9	1065	66.1
25 ≤	120	7.4
No response	140	8.7
Respondents' BMI before the first pregnancy		
< 18.5	386	23.9
18.5-24.9	1025	63.6
25 ≤	57	3.5
No response	144	8.9
Respondents' BMI the second pregnancy		
< 18.5	182	11.3
18.5-24.9	652	40.4
25 ≤	43	2.7
No response	735*	45.6

*Note: mothers including not have the second baby

The respondents were also asked if their breast shape and weight had returned to their pre-pregnancy status. Table 32 identifies the maternal perceptions of returning to their pre-pregnancy weight. The respondents who felt they had retained weight at 18 months postpartum were slightly higher than those who felt they had returned to

their pre-pregnancy weight. The more than half of the mothers who had returned to their pre-pregnancy weight (59.6%) stated their weight return occurred within six months after birth, see Table 33.

Table32: Women's perceptions about their return to their pre-pregnancy weight

	n	%
Yes	900	55.8
No	669	41.5
No response	43	2.7
Total	1,612	100.0

Table 33: Women's perceptions of time when they returned to their pre-pregnancy weight (If say 'yes' in Table 33)

	n	%
1-2 months after birth	213	23.7
3-4 months after birth	150	16.7
5-6 months after birth	173	19.2
7-8 months after birth	84	9.3
9-10 months after birth	68	7.6
11-12 months after birth	138	15.3
No response	74	8.2
Total	900	100.0

The respondents were asked if they had undertaken any activities to regain their body shape, which is shown in Table 34. While the majority (83.1%) did not engage in any activities to regain their body shape, those who undertook these activities wore special bra or underwear by 39.1%, which was the most popular activity to regain their body shape; see Table 35. Table 36 presents the starting time when those respondents who reported undertaking the activities listed in Table 35. The highest proportion stated activated aimed at improving their body shape within one to two months after birth

Table 34: Activities by respondents to regain pre-pregnancy body shape

	n	%
Yes	233	14.5
No	1340	83.1
No response	39	2.4
Total	1,612	100.0

Table35: Distribution of types of the activities reported in Table 34

	n	%
Attended antenatal class	11	4.7
On low calories and fat diet	36	15.5
Did exercise	38	16.3
Wear special bra/underwear	91	39.1
Combined above methods	57	24.5
No response	0	0.0
Total	233	100.0

Table 36: Starting time of the activities (If say 'yes' in Table 34)

	n	%
1-2 months after birth	102	43.8
3-4 months after birth	34	14.6
5-6 months after birth	31	13.3
7-8 months after birth	18	7.7
9-10 months after birth	9	3.9
11-12 months after birth	33	14.2
No response	6	2.6
Total	233	100.0

Table 37 shows maternal perceptions as to whether their breast shape had returned to their first pre-pregnancy shape. While more than a third of the respondents (36.6%) felt that their breast shape regained their pre-pregnancy shape, the majority disagreed. However, amongst the respondents who had returned to their original breast shape, more than a third (36.3%) stated it occurred at nearly one year after birth (Table 38).

Table37: Women's perceptions of returning their breast shape to pre-pregnancy shape

	n	%
Yes	590	36.6
No	973	60.4
No response	49	3.0
Total	1,612	100.0

Table38: Perceived time when returning breast shape as the first pregnancy (If say 'yes' in Table 37)

	n	%
1-2 months after birth	73	12.4
3-4 months after birth	67	11.4
5-6 months after birth	80	13.6
7-8 months after birth	64	10.8
9-10 months after birth	55	9.3
11-12 months after birth	214	36.3
No response	74	6.3
Total	590	100.0

The questionnaire also included additional questions related to maternal perceptions towards changes in breast appearance due to breastfeeding, (see Figure 10). The greatest change in their breast appearance for the mothers at 18 months postpartum was a 'loss in firmness' of their breast, compared to pre-pregnancy, reported by 76.2%, followed by their 'smaller breast size' after weaning (61.7%) and their 'breast sagging' (51.8%). Nearly two thirds (62.9%) stated that they were dissatisfied about their current breast shape. More than half (57.2%) agreed with the statement that 'breastfeeding made their body shape return faster than infant formula feeding'

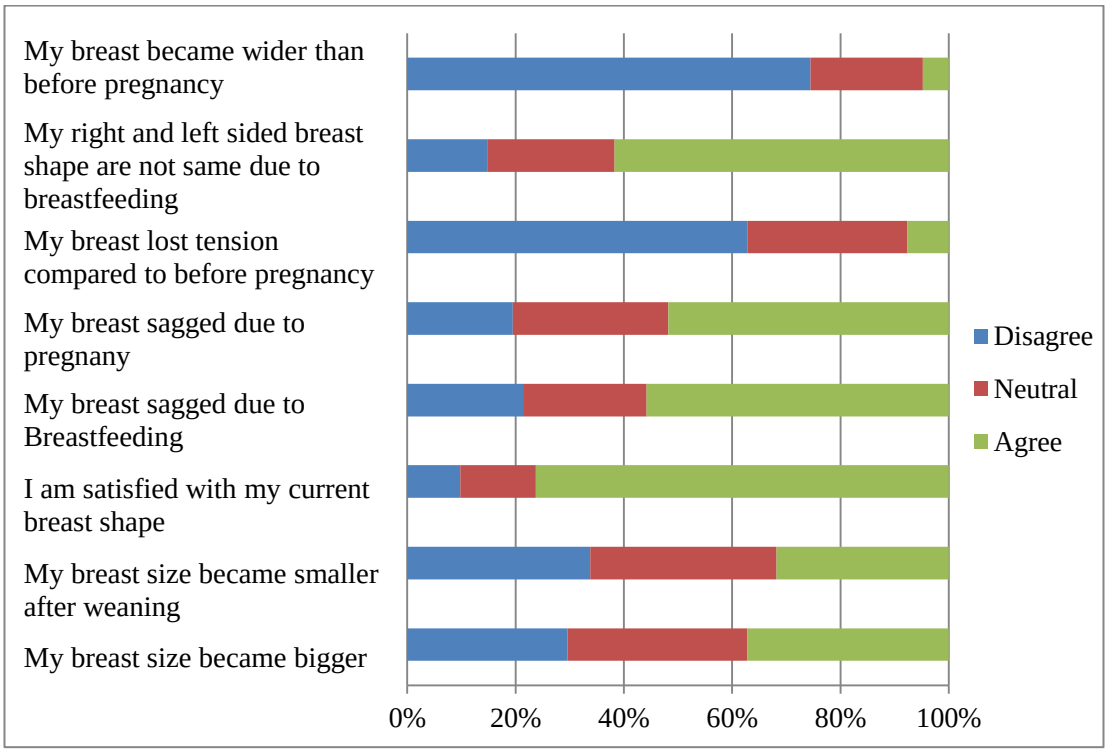


Figure 10: Women's descriptions of perceived changes in breast appearance (n = 1,612)

4.4.2 The Attention to Body Shape Scale (ABS) and the Body shape Questionnaire (BSQ-8c)

The results of the ABS, a measure to assess the level of concerns about body appearance that was used in this study are shown in Table 39. The average score of the ABS was 22.5 (SD = 3.6). Overall, postpartum women were conscious about their body shape. More than two thirds (65.9%) disagreed with the statement that they were 'not self-consciousness about their body shape' and more than half (55.4%) agreed that they were attentive to their body shape. (Note the way of the item 3 question in the ABS is a as a double-negative and therefore most of the Japanese respondent were self-conscious about their body shape) The same percentage of the respondents (54.1%) also considered to buy cloths in order to cover weak points of their body parts. The majority answered most items by either 'strong agree'/'agree' or 'neutral'. The Cronbach alpha level for the ABS was 0.53, which shows a reasonable level of internal consistency.

Table39: The Attention to Body Shape Scale (ABS) among respondents (n = 1,612)

Item	Strong Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strong Disagree (%)
1. I place great importance of deal with body shape	4.3	36.6	36.1	15.0	8.0
2. I buy a product that promise to give me a better body	4.7	40.7	38.7	11.0	4.9
3. I am not self-conscious about my body shape	1.6	7.4	25.1	42.6	23.3
4. I am always trying to improve my body shape	9.8	44.3	36.2	7.4	2.3
5. I wear clothes that highlight best aspect of my body and hide the worst aspect of my body	8.7	48.5	34.8	6.5	1.6
6. It really bothers me when I cannot keep my body in shape	8.1	42.1	34.0	12.9	2.8
7. I am very attentive to my body shape	6.1	49.6	34.7	8.1	1.5

When completing the questionnaires, the respondents were asked about perceptions of their body shape over the last four weeks using the BSQ-8c, which assessed the respondents' perceptions of dissatisfaction about their body shape (Table 40). Although the BSQ-8c has eight items, only five items were used in this study due to

the privacy issues raised by the Ethics Committee in Himeji city. The mean score of the short form of BSQ-8c was 13.7 (SD = 6.4) and their perceptions shared almost two sided; never thought or thoughts regardless of the frequency of thinking time. The Cronbach alpha level of the BSQ-8c was 0.82.

Table40: The short form of the Body shape questionnaire (BSQ-8c) by Japanese women at 18 months postpartum (n = 1,612)

Item	Never (%)	Rarely (%)	Some-times (%)	Often (%)	Very Often (%)	Always (%)
1. Have you been afraid that you might become fat (or fatter)?	19.9	15.5	18.4	11.2	15.9	19.1
2. Have you felt excessively large and rounded?	42.2	16.5	10.5	7.4	9.4	14.1
3. Have you thought that you are in the shape you are because you lack self-control?	31.7	18.4	17.9	9.3	11.4	11.2
4. Has seeing your reflection (e.g. in a mirror or shop window) made you feel bad about your shape?	52.0	22.6	10.3	5.3	5.5	4.4
5. Have you been particularly self-conscious about your shape when in the company of other people?	27.7	25.3	18.9	10.9	9.5	7.7

In summary, the questions related to their bodies might be too personal for the mothers as the response rate was not as high as for other questions. However, many postpartum women considered changes about their body/breast shape and weight status after birth. They therefore, participated in activities to regain their pre-pregnant shape and weight, indicating postpartum mothers in this study was very concerned about their body/breast shape.

4.4.3 Women's perceptions about their body weight and breast shape changes

The postpartum women were asked 'do you feel your body weight has returned to your weight before the first pregnancy?' Cross tabulation shows that the women's perceptions of changes on their body weight, compared with their pre-pregnancy, were not associated with the most demographic factors except maternal age ($p < 0.05$), annual family income ($p < 0.05$), and 'any breastfeeding' for six months

postpartum ($p < 0.05$) (Table 41). Maternal Body Mass Index (BMI) with 'underweight' at pre-pregnancy and 18 months postpartum were also related to their perceptions of returning about their body weight.

Table41: Women's perceptions of body weight return before their first pregnancy by their demographics (n = 1,612)

	Perceived weight returns before the first pregnancy		
	Yes N (%)	**No N (%)**	**P value**
Mother's age (years)			
< 25	33 (50.0)	33 (50.0)	0.048
25-29	184 (52.9)	164 (47.1)	$\chi^2 = 7.883$
30-34	415 (57.6)	305 (42.4)	df = 3
35+	254 (62.0)	156 (38.0)	
Family annual income (yen)			
< 2,500,000	115 (53.7)	99 (46.3)	0.018
2,500,001-4,500,000	328 (54.5)	274 (45.5)	$\chi^2 = 11.967$
4,500,001-6,500,000	243 (59.0)	169 (41.0)	df = 4
6,500,001-8,5000,000	118 (66.7)	59 (33.3)	
8,5000,001 <	48 (65.8)	25 (34.2)	
Any breastfeeding duration			0.004
< 6months	315 (52.8)	282 (47.2)	$\chi^2 = 8.117$
≥ 6 months	582 (60.1)	386 (39.9)	df = 1
Maternal BMI before the first pregnancy			
< 18.5	125 (68.7)	57 (31.3)	0.002
18.5-24.9	358 (55.5)	287 (44.5)	$\chi^2 = 12.973$
≥ 25	20 (45.5)	24 (54.5)	df = 2
Maternal BMI at 18 months postpartum			
< 18.5	252 (87.8)	35 (12.2)	0.000
18.5-24.9	569 (53.5)	494 (46.5)	$\chi^2 = 163.466$
≥ 25	33 (26.6)	91 (73.4)	df = 2

Note: parity, marital status, delivery methods, maternal occupation, husbands' occupation, birth weight were not statistically significant.

Table 42 compares maternal demographics and breastfeeding factors among two groups of postpartum women's perceptions of their breast shape changes as the first pre- pregnancy. A difference in parity ($p < 0.01$) and breastfeeding duration ($p < 0.01$) were observed.

Table42: Women's perceptions of returns about their breast shape as the first pre-pregnancy by their demographics (n = 1,612)

	Perceived breast shape returns as the first pre-pregnancy		
	Yes n (%)	**No n (%)**	**P value**
Parity			0.000
primipara	293 (43.3)	384 (56.7)	$\chi^2 = 15.286$
multipara	297 (33.6)	587 (66.4)	df = 1
Any breastfeeding duration			0.000
< 6months	266 (44.6)	331 (55.4)	$\chi^2 = 18.657$
≥ 6 months	324 (33.6)	639 (66.4)	df = 1

Note: maternal age, marital status, delivery methods, maternal occupation, husbands' occupation, birth weight, family annual income, maternal BMI before the first pregnancy and maternal BMI at 18 months postpartum were not statistically significant.

Table 43 shows the factors that were associated with the postpartum women's perceptions of their weight returning to their first pre-pregnancy weight using backwards logistic regression (LR). The respondents who perceived that their weight had return to their pre-pregnancy weight were entered as the reference levels in the multivariate model. The women whose BMI at 18 months postpartum were within the 'normal' and 'obesity' range were less likely to perceive that their weight had returned to pre-pregnancy levels ($p < 0.01$). Even if their pre-pregnancy BMI was in the 'underweight,' they also tended not to perceive that their weight had returned to its pre-pregnancy level ($p < 0.01$). In the group of the family annual income between 4,500,001 JP¥ and 6,500,000 JP¥ were more likely to perceive the return their weight as their first pre-pregnancy ($p < 0.01$).

Table43: Factors associating with the postpartum women's perceptions of weight return as their first pregnancy by backwards stepwise regression (n = 1,612)

Factors	**Adjusted OR**	**95% CI**
Respondents' BMI at 18 postpartum		
< 18.5	1.00	reference
18.5-24.9	0.09	0.04-0.17
≥ 25	0.02	0.01-0.04
Respondents' BMI before the first pregnancy		
< 18.5	**0.14**	**0.04-0.42**
18.5-24.9	**0.37**	**0.12-0.99**
≥ 25	1.00	reference

Family annual income (yen)		
< 2,500,000	1.00	reference
2,500,001-4,500,000	1.43	0.88-2.33
4,500,001-6,500,000	**1.72**	**1.03-2.88**
6,500,001-8,5000,000	**2.53**	**1.35-4.74**
8,5000,001 <	2.16	0.97-4.84

- -2 Log likelihood = 976.287
- Non-significant factors (potential confounders) included in the full model were mothers' age, ABS score, any breastfeeding duration

Table 44 identifies the significant factors that were associated with the postpartum women's perceptions of their breast shape changes. If their current BMI status was in 'normal' or 'obesity' range they were more likely to perceive that changes had occurred in their breast shape. However, the result found that the postpartum women who had a longer duration of breastfeeding (more than six months) were less likely to perceive that their breast shape had changed ($p < 0.01$).

Table44: Factors that influencing on the postpartum women's perceptions of breast shape changes at 18 months postpartum by backwards stepwise regression (n = 1,612)

Factors	Adjusted OR	95% CI
Respondents'BMI at 18 postpartum		
< 18.5	1.00	reference
18.5-24.9	**1.64**	**1.10-2.44**
≥ 25	1.78	0.96-3.32
Any breastfeeding duration		
< 6months	1.00	reference
≥ 6 months	**0.61**	**0.45-0.83**

- -2 Log likelihood = 1012.876
- Non-significant factors (potential confounders) included in the full model were mothers' age, ABS score, maternal BMI before the first pregnancy, and family annual income

4.4.4 Significant factors of Japanese women's body image that affected 'any breastfeeding' duration to six months postpartum

Stepwise logistic regression analysis was performed to identify factors associated with 'any breastfeeding' to six months postpartum, (see Table 45). Independent variables that were included in the multivariate regression model included the significant variables from the Table 30 and the women's perceptions of body weight return, breast shape changes, ABS score and women's BMI before the first pregnancy and women's BMI at 18 months postpartum. 'Any breastfeeding' to more than six months postpartum was more likely among the respondents who were

primiparous mothers (adjusted OR = 2.26, 95% CI = 1.05-4.87, p = 0.037), 'made the decision on infant feeding methods before pregnancy' (adjusted OR = 2.73, 95% CI = 1.79-4.18, p = 0.000), late introduction of infant formula (adjusted OR = 1.07, 95% CI = 1.03-1.11, p = 0.001), and alcohol intake during breastfeeding (adjusted OR = 2.00, 95% CI = 1.18-3.39, p = 0.010. In contrast, the women who were employer as non-professionals, smokers, and had breast problems were negatively related to breastfeeding duration to six months postpartum. It was a noticeable finding that postpartum women who perceived changes in breast shape were less likely to continue breastfeeding to six months postpartum (adjusted OR = 0.60, 95% CI = 0.40-0.91, p = 0.015). Higher scores of the ABS were not significant (using the five questions that were included).

Table45: The relationship of significant factors and 'any breastfeeding' to six months postpartum (n = 1,612)

Factors	Adjusted OR (95% CI)	p value
The age of infants first had infant formula (weeks)*	**1.07 (1.03-1.11)**	**0.001**
ABS Score*	0.95 (0.90-1.01)	0.095
Parity		
Primipara	**2.26 (1.05-4.87)**	**0.037**
Multipara	1.00 (reference)	
Maternal occupation		**0.020**
Self-employed	0.94 (0.24-3.61)	0.923
Professional work	0.89 (0.36-2.19)	0.797
Non-professional work	**0.41 (0.23-0.72)**	**0.002**
House duties	1.00 (reference)	
Timing of deciding infant feeding methods		**0.000**
Before pregnancy	**2.73 (1.79-4.18)**	**0.000**
Early pregnancy	1.70 (0.87-3.33)	0.124
Late pregnancy	0.99 (0.41-2.38)	0.979
During labour	1.90 (0.51-7.04)	0.338
After delivery	1.00 (reference)	
Breastfeeding problems		
Yes	**0.34 (0.23-0.51)**	**0.000**
No	1.00 (reference)	
Alcohol intake during breastfeeding		
Yes	**2.00 (1.18-3.39)**	**0.010**
No	1.00 (reference)	
Maternal smoking status		**0.010**
Yes	**0.32 (0.15-0.66)**	**0.002**
Yes, but quit during breastfeeding	0.74 (0.12-4.53)	0.746
No	1.00 (reference)	
Maternal perceptions of changes in breast shape		
Yes	**0.60 (0.40-0.91)**	**0.015**
No	1.00 (reference)	

- *Continuous variables
- -2 Log likelihood = 633.795
- Non- significant variables (potential confounders) included in the full model were maternal age, the IIFAS score, ABS score, infant first feeds, husbands' occupation, family annual income, women's perception of weight return as their pre-pregnancy, women's BMI before the first pregnancy, and women's BMI at 18 months postpartum

4.5 Summary

Demographic factors showed that the majority of the respondents in Himeji were in their early 30s, married, unemployed, non-smokers, and non-drinker during breastfeeding. They also had stable income but had less positive support from their husbands and own mothers when making decision about infant feeding methods. The majority had a BMI at 18 months postpartum and before the first pregnancy in the 'underweight' or 'normal' categories. When these factors were entered into a multivariate logistic regression, mother's age, working mothers in non-professional areas, experienced in breastfeeding problems, maternal smoking status during breastfeeding, and maternal perceptions of changes in breast shape were less likely to continue 'any breastfeeding' till six months after delivery. In contrast, later introduction of infant formula, primipara, earlier timing for decision on infant feeding methods, alcohol intake during breastfeeding positively affected 'any breastfeeding' duration. These factors will be discussed in the chapter six and the results from the Australian study are provided in the next part.

Part 2: The Australian infant feeding study

The second part of this chapter reports the results from a further analysis the Perth Infant Feeding Study Mark II (PIFS II), a cohort study of infant feeding from birth to 12 months of age. This analysis is particularly, focused on any relationship between 'any breastfeeding' duration to six months of age and postpartum women's body image. Other results from the PIFS II are analysed and published elsewhere (Graham, Scott, Binns, & Oddy, 2005; Scott, et al., 2006; Win, et al., 2006). The following 10 pages (Section 4.6) have been rewritten from the PIFSII report.

4.6 The Perth Infant Feeding Study Mark II (PIFS II)

The PIFS II was conducted at two major public hospitals in Perth, Western Australia, between September 2002 and July 2003. It was a repeat of a study undertaken 10 years earlier of infants born at the same hospitals. Overall, 870 of 1,068 postpartum women were recruited and were asked to complete a self-administered questionnaire within the first three days after childbirth in order to obtain baseline information. 587 completed the baseline questionnaires, a response rate of 68%. Follow-up telephone interviews were held on a further seven occasions over a period of 12 months (4, 10, 16, 22, 32, 40, and 52 weeks postpartum). The questionnaire related to infant feeding practices used in this study was almost the same as the one used in the Japanese study. However, the questions related to the postpartum women's body image scales were different.

4.6.1 Descriptive results of demographics and breastfeeding factors

Table 46 presents the demographics details of the respondents in the PIFS II. The highest proportion by age was the participants in their 30s (30.4%). The majority were Australian born (73.2%), legally married (92.0%) and had completed a high school education (year 12) (64.1%), and were multiparous (63.2%). The Caesarean-section rate was 29.1%. The Male/female ratio at birth was 1.16, and the majority of their infants (96.4%) were born with 'normal' weight. The majority of the respondents (87.2%) and their husbands/partners (90.8%) were employed, at least prior becoming pregnant for the respondents. The highest percentage of annual family income was at the group between AU$ 25,000 and AU$ 40,000 at 31.0%.

Table46: Demographic characteristics of respondents (n = 587)

		n	%
Respondents' age (years)			
	< 25	154	26.2
	25-29	170	29.0
	30-34	178	30.3
	35 +	84	14.3
	No response	1	0.2
Parity			
	Primipara	216	36.8
	Multipara	371	63.2
	No response	0	0.0

Marital status			
	Married/Defacto	540	92.0
	Other	47	8.0
	No response	0	0.0
Respondents' occupation			
	Self-employed	1	0.2
	Professional work	103	17.5
	Non-professional work	408	69.5
	Unemployed	64	10.9
	No response	11	1.9
Delivery methods			
	Vaginal	411	70.0
	Caesarean section	171	29.1
	No response	5	0.9
Husbands'/partners' occupation			
	Self-employed	3	0.5
	Professional work	113	19.3
	Non-professional work	417	71.0
	Unemployed	13	2.2
	No response	41	7.0
Country of birth of mothers			
	Australia/New Zealand	428	72.9
	United Kingdom, Ireland	53	9.0
	Other	104	17.7
	No response	2	0.3
Respondents' education (years)			
	< 12	211	35.9
	≥ 12	376	64.1
	No response	0	0.0
Gender of the youngest child			
	Male	316	53.8
	Female	271	46.2
	No response	0	0.0
Birth weight of infants			
	< 2500g	13	2.2
	≧ 2500g	566	96.4
	No response	8	1.4
Annual family income (AU$)			
	Below 15,000	61	10.4
	15,000-25,000	82	12.3
	25,000-40,000	182	31.0
	Above 40,000	175	29.8
	No response	97	16.5

Table 47 showed that the time at which infant feeding methods was decided by the respondents. Nearly 60% decided infant feeding methods before pregnant following during pregnancy by about 36%. Only 4% decided it after baby was born.

Table 47: The time when first decided how to feed their infants by Australian women

	n	%
Before pregnancy	351	59.8
Early pregnancy	188	32.0
Late pregnancy	24	4.1
After baby was born	24	4.1
No response	0	0.0
Total	587	100.0

The reasons for choosing breastfeeding, the reasons for not choosing breastfeeding, breastfeeding problems, and maternal experiences of breastmilk expression have been previously published (Binns & Scott, 2002a).

The majority (83.8%) of the respondents breastfed their infants at discharge. Among the reasons given for choosing breastfeeding was 'better for baby', which was the highest proportion (95.4%), following 'more convenient' by 75.6%, 'cheaper' by 60.9%, and 'prevents allergies' by 51%. Nearly 42% stated that breastfeeding helped with post-pregnancy weight reduction. The 90 respondents who were not breastfeeding at discharge, including 66 did not even try to breastfeed their infants after birth, gave reasons including 'their husbands can help feeding' by 53.7% and 'dislike breastfeeding' by 40.7%. Some of them felt that 'bottle feeding was easier' (38.9%) or 'infant formula is good as breastmilk' (20.4%). The 24 respondents changed from breastfeeding to infant formula before discharge because 'breastfeeding was painful' or 'baby refused breast'

At each study questionnaire, the respondents were also asked if they had expressed breastmilk since the last interviews. Throughout all seven occasions of follow up interviews, 72.7% had expressed breastmilk at some time during 12 month period. The most common methods of expressing breastmilk was a manual pump, ranging from 64% at week four postpartum to 67% at week 22 postpartum. Approximately 20 % used an electric pump for expression. Compared to the respondents who had never expressed breastmilk, those who did so were less likely to cease any breastfeeding (Relative Risk = 0.71, 95% CI = 0.52-0.98).

The number of women reporting breastfeeding problems was highest between hospital discharge and four weeks postpartum. At four weeks postpartum, the

proportion of the women having problems was reported as 44.2%, which was the highest rate of any reporting period. The most common problem by 10 weeks postpartum was 'cracked or sore nipples' (56.3%). While 'breast engorgement/pain', 'positioning/attachment problems', and 'baby's tiredness/sleeping' were high during their hospitals stay (23.3%, 27.0%, and 38.1%, respectively), these problems declined by four weeks postpartum (5.0%, 7.4%, and 2.2%, respectively). However, 'insufficient/inadequate breastmilk supply' became the most common problem reported from four weeks postpartum to 52 weeks postpartum. By 16 weeks postpartum, the proportion of the women reporting breastfeeding problems declined as problems were resolved and mothers establish a routine of breastfeeding.

Figure 11 shows the family (respondents' husbands and their own mothers) preferences for infant feeding methods. More than half of their husbands positively supported breastfeeding (53.5%), while a few postpartum women stated that they had not discussed the issues (9.2%). Although a third of their own mothers supported breastfeeding (33.8%), more than half of them stated that their own mothers either had no opinion (42.2%) or they had not discussed this issue (22.9%). In both groups, husbands and own mothers, there were few who supported bottle feeding.

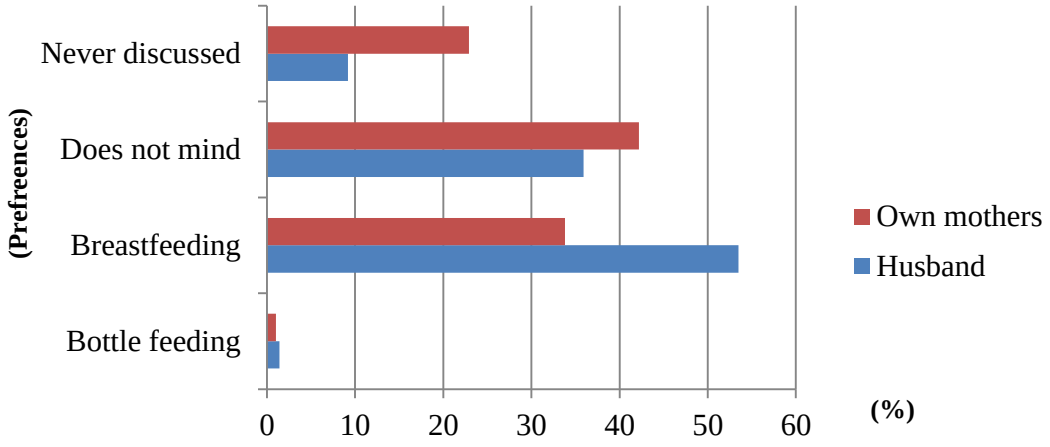


Figure 11: The family (respondents' husbands and their own mothers) preferences towards infant feeding methods (n = 587)

Table 48 identifies that more than 75% of the respondents' own mothers had experienced breastfeeding, while most of close friends chose breastfeeding' (Table 49).

Table 48: Experiences of breastfeeding among respondents 'own mothers (grandmothers of infants)

	n	%
Yes	446	76.0
No	85	14.5
Do not know	53	9.0
No response	3	0.5
Total	587	100.0

Table 49: Distribution of infant feeding methods of respondent's close friends

	n	%
Mostly bottle	56	9.5
Mostly breastfeeding	202	34.4
Bottle feeding and breastfeeding	282	48.0
Friends do not have babies	24	4.1
I do not know	20	3.4
No response	3	0.5
Total	587	100.0

Table 50 identifies that breastmilk was the first food given to their infants (84.2%), which indicates the high initiation rate of breastfeeding reported in this study.

Table 50: The first food for infants had at the hospitals after birth

	n	%
Infant formula	89	15.2
Breastmilk	494	84.2
Sugar water/Water (including glucose)	1	0.2
Do not know	1	0.2
No response	2	0.3
Total	587	100.0

Table 51 shows the average duration of breastfeeding in this study. The average duration of any breastfeeding was 23.3 weeks (approximately 5.8 months), the average age when infant formula was introduced 8.8 weeks, and 17.6 weeks (approximately 4.4 months) was the average age that their infants were first fed solid foods.

Table 51: The breastfeeding practices by Australian women

	n (Not response)	Mean	SD
Duration of 'any breastfeeding' (in weeks)	587 (0)	23.32	19.73
The time when first introducing infant formula (in weeks)	480 (107*)	8.79	11.13
The age of the infants first had solid foods (in weeks)	516 (71)	17.58	4.91

*Including mothers not giving formula at all

Figure 12 illustrates that infants' age at which infant formula was first commenced. A gradual increase in use of infant formula was observed from two weeks postpartum and by 52 weeks all infants had been given infant formula. By eight weeks postpartum, a half of infants had been given at least some infant formula. The use of soy formula was uncommon (2-4%), but the use of thickened formula had increased to 7% at 22 weeks postpartum.

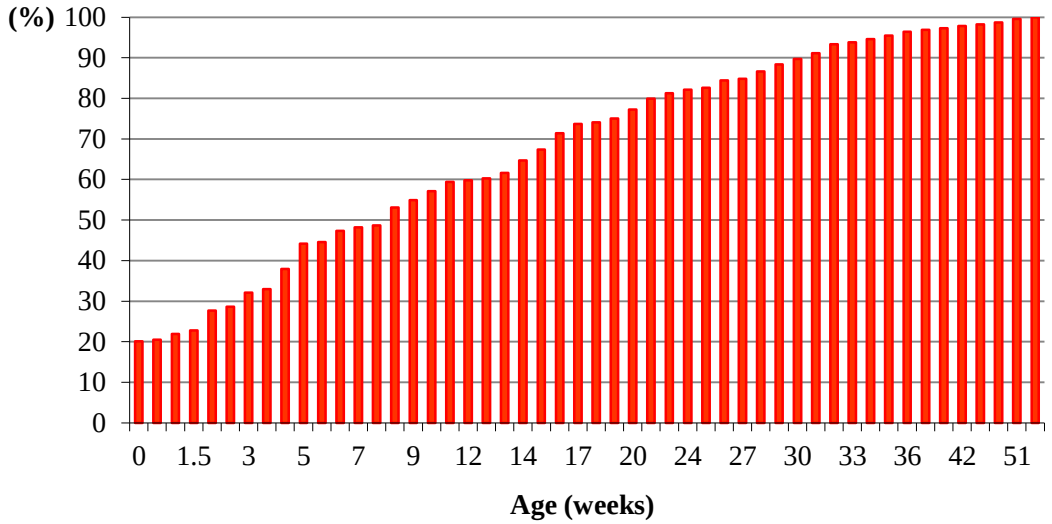


Figure 12: Age of infant (weeks) and introduction of infant formula

Source :(Binns, et al., 2005)

Table 52 outlines the prevalence of breastfeeding duration from four weeks to 52 weeks postpartum. At discharge from hospitals, the majority (93.8%) breastfed their infants, and 75.6% were exclusively breastfeeding. The rate of exclusive breastfeeding rapidly declined from 16 weeks postpartum to 22 weeks postpartum.

Table 52: Prevalence of breastfeeding duration ('Any' and 'Exclusive') up to 52 weeks of age

Weeks	Total sample n*	Any breastfeeding n (%)	Exclusive breastfeeding n (%)
4	528	394 (67.0)	175 (33.1)
10	507	325 (64.2)	147 (29.0)
16	486	287 (59.1)	75 (15.4)
22	483	248 (52.0)	18 (3.7)
32	465	196 (42.1)	1 (0.2)
40	465	161 (34.6)	1 (0.2)
52	455	111 (24.4)	0 (0.0)

*sample size, number of mothers remaining in the study
Source :(Binns, et al., 2005)

Several papers have been published on maternal smoking status and alcohol consumption, as it relates to breastfeeding (Giglia & Binns, 2007; Giglia, et al., 2006a; Giglia, Binns, Alfonso, Scott, & Oddy, 2008). A short summary is provided here.

While the smoking rate reported by the respondents lies between 23% and 39% during the follow-up periods, the paternal smoking rate was higher than the respondents' one, ranging from 24% to 47% (Figure 13). The respondents tended to quit smoking when they became pregnant. However, many fathers ceased smoking after the infants were born when the largest decline was observed. The smoking rate in both groups did not markedly change between week 16 and week 52.

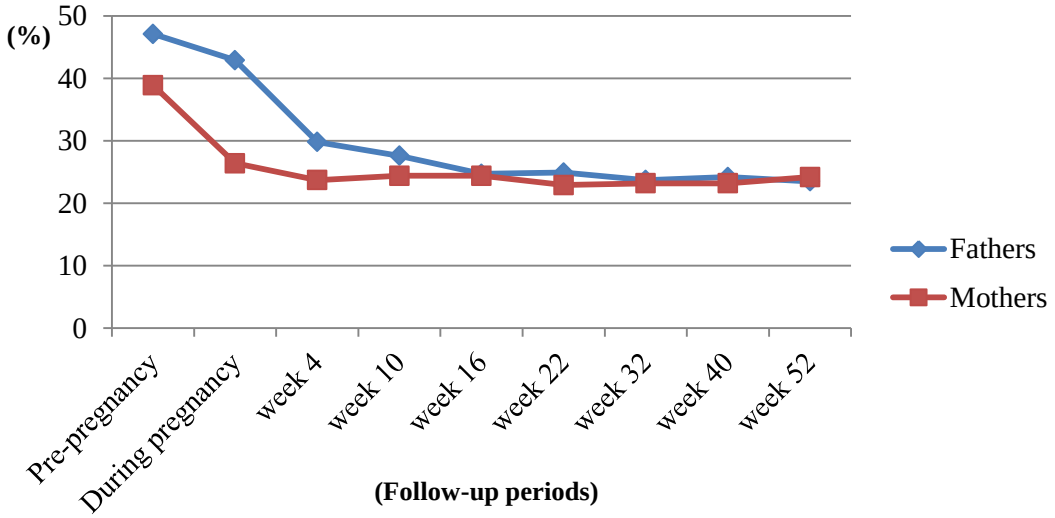


Figure 13: Proportion (%) of the respondents' (mothers) and their husbands' (fathers) who smoked during the study time (n = 587)

Source :(Binns, et al., 2005)

The average consumption level of cigarettes per day throughout the study period is shown in Table 53. Among the respondents who smoked cigarettes, the majority smoked less than 20 cigarettes daily.

Table 53: Proportion (%) of average consumption level of cigarettes per day in each study time by Australian respondents (n = 587)

Weeks	<5	5-9	19-19	20-29	≥30	No response
4	24 (4.1)	37 (6.3)	46 (7.8)	17 (2.9)	0 (0.0)	463 (78.9)
10	19 (3.2)	38 (6.5)	48 (8.2)	16 (2.7)	1 (0.2)	465 (79.2)
16	16 (2.7)	39 (6.6)	45 (7.7)	14 (2.4)	1 (0.2)	472 (80.4)
22	14 (2.4)	31 (5.3)	49 (8.3)	15 (2.6)	1 (0.2)	477 (81.3)
32	13 (2.2)	24 (4.1)	52 (8.9)	16 (2.7)	2 (0.3)	480 (81.8)
40	12 (2.0)	32 (5.5)	46 (7.8)	16 (2.7)	1 (0.2)	480 (81.8)
52	10 (1.7)	39 (6.6)	41 (7.0)	19 (3.2)	0 (0.0)	478 (81.4)

*No response includes non-smoking mothers
Source :(Binns, et al., 2005)

In the PIFS II, multivariate analysis found that the maternal smoking status was negatively associated with the duration of breastfeeding at all periods of follow-up (Table 54). By 10 weeks postpartum, the risk of the ceasing breastfeeding became highest (RR = 1.90) if the women smoked, compared with non-smoking women.

Table 54: Relative Risk (RR) and Confidence Interval (CI) of breastfeeding cessation by multivariate analysis

Weeks	Total sample n	RR of breastfeeding cessation if mothers smoke	95% CI
4	393	1.65	1.22-2.23
10	326	1.90	1.52-2.38
16	279	1.82	1.49-2.22
22	250	1.63	1.37-1.94
32	194	1.54	1.34-1.77
40	158	1.33	1.18-1.50
52	109	1.19	1.08-1.31

Source :(Binns, et al., 2005)

The alcohol consumption by Australian respondents from their pre-pregnancy to 52 weeks postpartum is presented in Figure 14. The proportion of the respondents who drank alcohol during the review periods ranged from 40.2% to 48.5%, with a mean of 45.4%. The largest decline was found between pre-pregnancy and during pregnancy. However, after delivery, the proportion consuming alcohol remained steady.

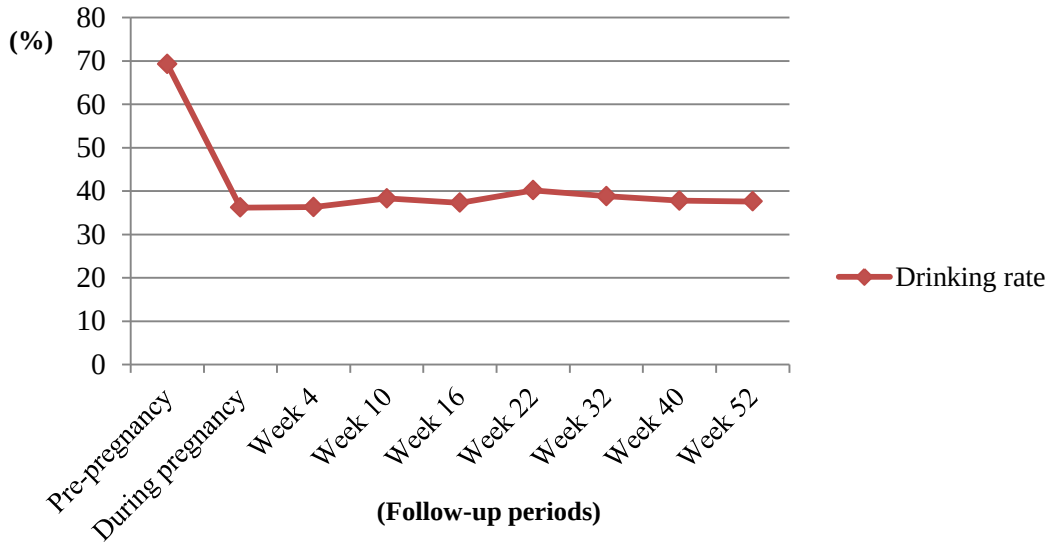


Figure 14: Proportion (%) of alcohol consumption by the respondents during the study time (n = 587)

Source:(Binns, et al., 2005)

Table 55 shows the times when alcohol was consumed by the respondents during breastfeeding. Throughout any follow-up study time, most of them who drank alcohol took it before/after/with meals. However, by 16 week postpartum, some women consumed alcohol just after breastfeeding.

Table 55: Proportion (%) of drinking time in each study time by Australian respondents (n = 587)

Weeks	Before feedings	Just after feedings	In between feedings	No particular time	Before/after /with meals	No response*
4	2 (0.3)	45 (7.7)	29 (4.9)	28 (4.8)	109 (18.6)	374 (63.7)
10	1 (0.2)	55 (9.4)	17 (2.9)	24 (4.1)	130 (22.1)	360 (61.3)
16	0 (0.0)	36 (6.1)	15 (2.6)	27 (4.6)	141 (24.0)	368 (62.7)
22	0 (0.0)	19 (3.2)	17 (2.9)	26 (4.4)	174 (29.6)	351 (59.8)
32	1 (0.2)	12 (2.0)	10 (1.7)	14 (2.4)	191 (32.5)	359 (61.2)
40	1 (0.2)	7 (1.2)	5 (0.9)	10 (1.7)	199 (33.9)	365 (62.2)
52	0 (0.0)	6 (1.0)	5 (0.9)	11 (1.9)	199 (33.9)	366 (62.4)

*No response includes non-drinking alcohol mothers
Source :(Binns, et al., 2005)

Table 56 presents the maternal alcohol consumption related to breastfeeding duration. Although on average 40% of the women consumed alcohol, this did not significantly influence the duration of breastfeeding, except for the periods ending in week 40 postpartum.

Table 56: Relative Risk (RR) and Confidence Interval (CI) of cessation breastfeeding if women drink alcohol

Weeks	Total sample n	RR of breastfeeding cessation if mothers drink	95% CI
4	393	1.02	0.86-1.12
10	326	0.92	0.78-1.08
16	284	0.92	0.78-1.09
22	250	1.11	0.93-1.34
32	194	1.08	0.90-1.30
40	157	1.25	1.04-1.49
52	109	1.18	0.96-1.44

Source:(Binns, et al., 2005)

4.6.2 The score of the Iowa Infant Feeding Attitudes Scales (IIFAS)

The distribution of the each item in the IIFAS was shown in Table 57. The Australian postpartum women were asked their attitudes towards and knowledge of infant feeding methods while their hospital stays. The average score of the IIFAS was 64.4 (SD = 8.3), indicating that the respondents were more likely to have positive attitudes towards breastfeeding. In a similar way to the Japanese study (see above), the responses were re-categorized into three point scales: 1 = Agree, 2 = Neutral, and 3 = Disagree.

The majority agreed with the cost performance of breastmilk (94.2%), the ideality of breastmilk as infants' food (86.4%), and an increase in the connection between mothers who breastfed and their infants (82.6%). While over 78% disagreed with a thought about breastfeeding in public places, nearly 25% believed that infants are overfed by breastmilk than infant formula. Nearly 71% agreed with the convenience of breastfeeding and about 41% believed that infant formula is healthy as breastmilk. The Cronbach alpha level, indicating reliability of the measurement, was 0.50.

Table 57: Australian postpartum women's knowledge and attitudes towards breastfeeding while in hospitals using the IIFAS (n = 587)

Item	Agree (%)	Neutral (%)	Disagree (%)
1. The nutritional benefit of breastmilk lasts only until the baby is weaned from breastmilk	14.5	29.3	56.2
2. Formula feeding is more convenient than breastfeeding	13.1	20.3	66.6
3. Breastfeeding increases mother-infant bonding	82.6	11.1	6.3
4. Breastmilk is lacking in iron	3.2	26.2	70.5
5. Formula-fed babies are more likely to be overfed than breastfed babies	24.6	45.9	29.5

6. Formula feeding is the better choice if mother plans to work outside the home	27.6	36.6	35.8
7. Mothers who formula feed miss one of the joys of motherhood	41.1	27.1	31.9
8. Women should not breastfeed in public places such as restaurants	8.9	12.9	78.2
9. Breast fed babies are healthier than formula fed babies	42.9	34.6	22.5
10. Breast fed babies are more likely to be overfed than formula fed babies	4.9	31.5	63.5
11. Father feels left out if mother breast feeds	11.9	25.7	62.4
12. Breastmilk is the ideal food for infants	86.4	9.4	4.3
13. Breastmilk is more easily digested than formula	66.6	25.0	8.3
14. Formula is as healthy for an infant as breastmilk	16.9	42.2	40.9
15. Breastfeeding is more convenient than formula feeding	71.2	21.0	7.8
16. Breastfeeding is less expensive than formula	94.2	3.1	2.7
17. A mother who occasionally drinks alcohol should not breastfeed her baby	23.5	29.6	46.8

Note: The items 1, 2, 4, 6, 8, 10, 11, 14, and 17 were reversed when calculating the score

- Disagree includes 'strongly disagree' and 'disagree'
- Agree includes 'strongly agree' and 'agree'

4.6.3 Factors affecting the cessation of 'any breastfeeding' before six months postpartum

Table 58 shows the risk factors for cessation of 'any breastfeeding' before six months of life after adjusting for confounders by multivariate analysis. The women who are younger (less than 35 years olds), return to work within six months after birth, use dummy/pacifier for their infants before 10 weeks postpartum. However, the women who decided on breastfeeding before pregnancy, attended antenatal classes for this or previous pregnancy, and whose partners and own mothers preferred breastfeeding had lower risks of cessation of any breastfeeding before six months postpartum.

Table 58: Significant factors affecting termination of any breastfeeding [a] before six months postpartum after adjustment for potential confounders[b] (n = 488)

Factors[c]	**Adjusted RR***	**95% CI**
Respondents' age (years)		
< 25	**2.18**	**1.33-3.56**
25-29	**2.28**	**1.43-3.64**
30-34	**1.92**	**1.20-3.10**
35 +	1.00	reference

Marital Status		
Not marriage	1.00	reference
Marriage	1.56	0.93-2.60
Gender of infants		
Male	1.00	reference
Female	0.78	0.60-1.02
Mother returned to work		
Before 6 months postpartum	**1.29**	**1.73-3.95**
Between 6 and 12 months postpartum	1.39	0.85-3.28
Had not returned to work by 12 months postpartum	1.00	reference
Dummy/pacifier usage		
Before 4 weeks postpartum	**2.54**	**1.73-3.71**
Between 4 and 10 weeks postpartum	**1.80**	**1.02-3.20**
After 10 weeks postpartum	1.06	0.46-2.41
Never	1.00	reference
Husbands prefers breastfeeding		
No or ambivalent	1.00	reference
Yes	**0.47**	**0.35-0.61**
Respondents' own mothers (grandmothers) prefers breastfeeding		
No or ambivalent	1.00	reference
Yes	**0.57**	**0.41-0.78**
Infant feeding decision was made in pre-pregnancy		
No	1.00	reference
Yes	**0.58**	**0.44-0.61**
Women attended antenatal classes for this or previous pregnancy		
No	1.00	reference
Yes	**0.59**	**0.45-0.78**

Source:(Binns, et al., 2005)

*RR= Relative Risk

- [a] Any breastfeeding includes full and partial breastfeeding.
- [b] Factors in the model included maternal age, years of education, marital status, country of birth and occupation; sex of infant, parity, delivery method, age of infant when mother returned to work, age of infant when first used a dummy, whether mother attended antenatal classes, when infant feeding decision was made, fathers infant feeding preference, maternal grandmother's infant feeding preference, whether maternal grandmother had ever breastfed.
- [c] All factors in the final model were variables for which when excluded the change in deviance compared with the corresponding X^2 test statistic on the relevant degrees of freedom was significant.

4.7 Postpartum women's body image in Australia

The PIFS II included the questions on respondents' BMI, which is shown in Table 59. More than half of the respondents had BMI levels between 18.5 and 24.9, which is classified as 'Normal'. 'Underweight' (BMI < 18.5) was found in about 8% postpartum women.

Table 59: Body Mass Index (BMI) by Australian respondents (n = 587)

		N	%
Respondents' BMI before pregnancy			
	< 18.5	45	7.7
	18.5-24.9	307	52.3
	25 ≤	192	32.7
	No response	43	7.3
Total		587	100.0

The questions included the women's perceived effects of breastfeeding on their body weight status (Table 60) and these were asked them at four weeks and 52 weeks postpartum. While more than half (53.2%) believed that breastfeeding made their weight reduce at week four postpartum, this proportion had declined at 52 week postpartum (26.4%).

Table 60: Proportions of postpartum women's beliefs of the effects of breastfeeding on their body weight in week 4 (n = 587) and 52 (n = 587)

Week	Effects of breastfeeding	n (%)	No response (%)
4	No effect	54 (9.2)	46 (7.8)
	Help for weight loss	312 (53.2)	
	Keeping weight on	11 (1.9)	
	Not known/not sure	160 (27.3)	
	Varies person to person	4 (0.7)	
52	No effect	55 (9.4)	286 (48.7)
	Help for weight loss	155 (26.4)	
	Keeping weight on	4 (0.7)	
	Not known/not sure	83 (14.1)	
	Varies person to person	4 (0.7)	

The women were also asked about their perceptions of their breast shape changes due to breastfeeding in week four and 52: 'what effect do you think breastfeeding has on the shape or size of women's breast after she has stopped feeding?' (Table 61) All opinions were categorized into one of following five groups: 1) 'become sagging', 2) 'no changes', 3) 'become smaller', 4) 'become bigger', and 5) 'not sure'.

Just over half (51%) noticed changes in their breast shape within four weeks of birth. The changes included their breast became 'sagging' (25%), 'smaller' (9.9%) and 'bigger' (3.4%), 'sagging and smaller' (5.8%), or 'sagging and bigger' (1.4%). A small number reported no changes (14%) and approximately 30% of the women answered that they were not sure about changes in breast shape. By 52 weeks, 60%

reported changes in their breast shape and only 11% had not noticed any changes to their breast shape. The highest prevalence of perceived change in breast shape at 52 weeks was 'sagging' (28.4%), following by 'smaller' (20.6%) and 'smaller and sagging' (6.5%). About 30% remained 'not sure' about the changes of their breast shape.

Table 61: Proportions of Australian women's perceptions of changes in breast changes due to breastfeeding in week 4 (n = 541) and 52 (n = 306)

	Breast changed		Not sure	No change
	Overall: n (%)	Details: n (%)	n (%)	n (%)
Week 4	276(51.1)	Sagged:146 (27.0)	183 (33.8)	82 (15.2)
		Smaller:58 (10.7)		
		Bigger:20 (3.7)		
		Combined*:42 (7.8)		
		Others**:10 (1.9)		
Week 52	183(59.8)	Sagged:87(28.4)	91 (29.7)	32 (10.5)
		Smaller:63 (20.6)		
		Bigger:8 (2.6)		
		Combined*:22 (7.2)		
		Others**:3(1.0)		

*Combined changes included more than one changes in shape (either 'sagged and smaller' or 'sagged and bigger')
** Others were not included in all categories

The women's perceptions of changes on their body weight at four weeks postpartum was associated with only the first food given to infant while in hospitals ($p < 0.05$), although others factors were examined by cross tabulations (Table 62). By 52 weeks postpartum, no significant association was found.

Table 62: Women's perceptions about the effect of breastfeeding onto their body weight at 4 weeks postpartum

	Perceived breastfeeding effect on body weight at 4 weeks		
	Yes, some effects n (%)	No, not known/not sure n (%)	p value
First food given to infants while in the hospitals			0.021
Infant formula	38 (48.1)	41 (51.9)	$\chi^2 = 5.320$
Breastmilk/colostrum	284 (61.9)	175 (38.1)	df = 1

Note: non-significant factors included gender of infants, delivery methods, maternal smoking status before pregnancy, maternal smoking status during pregnancy, husbands' smoking status before pregnancy, mothers' age, maternal occupation, husbands' occupation, parity, birth weight of infants, maternal education level, own mothers' preference of infant feeding methods, and own mothers' experiences of breastfeeding.

Table 63 and 64 presents that the association between the women's perceptions of changes on their breast shape and maternal demographics at four and 52 weeks postpartum respectively. Parity was significantly related to their perceptions of breast shape changes in both study periods.

Table 63: The women's perceptions of breast shape changes at 4 weeks postpartum

		Perceived breast shape changes due to breastfeeding at 4 weeks		
		Yes, changes n (%)	**No, not known/not sure n (%)**	**p value**
Parity				0.000
	primapara	79 (39.3)	122 (60.7)	$\chi^2 = 14.891$
	multipara	192 (56.5)	148 (43.5)	df = 1
Women's education level				0.053
	Not complete high school	89 (47.8)	97 (52.2)	$\chi^2 = 5.886$
	Completed high school or trade/Tafe certificate	158 (54.1)	134 (45.9)	df = 2
	Bachelor degree or higher	24 (38.1)	39 (61.9)	

Note: non-significant factors included gender of infants, delivery methods, maternal smoking status before pregnancy, maternal smoking status during pregnancy, mothers' age, first food given to infants while in hospitals, maternal occupation, husbands' occupation, parity, birth weight of infants, maternal education level, husbands' preferences about infant feeding methods, own mothers preference of infant feeding methods and own mothers experiences of breastfeeding.

Table 64: The women's perceptions of breast shape changes at 52 weeks postpartum

		Perceived breast shape changes due to breastfeeding at 52 weeks		
		Yes, changes n (%)	**No, not known/not sure n (%)**	**p value**
Parity				0.031
	primapara	55 (50.9)	53 (49.1)	$\chi^2 = 4.672$
	multipara	126 (63.6)	72 (36.4)	df = 1

Note: non-significant factors included gender of infants, delivery methods, maternal smoking status before pregnancy, maternal smoking status during pregnancy, mothers' age, maternal occupation, husbands' occupation, birth weight of infants, first food given to infant while in hospitals, maternal education level, husbands' preferences about infant feeding methods, own mothers preference of infant feeding methods, and own mothers experiences of breastfeeding.

Table 65 shows the effects of breastfeeding duration on the women's perceptions towards breast shape changes at 52 weeks using multiple logistic regressions. In the models, other risk variables that were identified in previous studies of this cohort are

included (Scott, Aitkin, Binns, & Aroni, 1999; Scott, et al., 2006; Scott, Landers, Hughes, & Binns, 2001). Overall, the women who had longer breastfeeding duration were more likely to perceive changes of their breast shape at week 52. For a one week increase in the duration of 'exclusive breastfeeding' up to six months, the average risk of perceived changes in breast shape at week 52 increased by 3.5% (95% CI = 1.00-1.07), by 3.8% (95% CI = 1.01-1.07) with 'any breastfeeding' duration up to six months, and by 2.9% (95% CI = 1.00-1.06) with 'full breastfeeding' up to six months, respectively. Moreover, the average risk of perceived changes in breast shape at week 52 increased by 0.8% (95% CI = 1.00-1.02), whenever the women increase 'any breastfeeding' duration up to 12 months with each additional week. For 'full breastfeeding' duration up to 12 months, this risk was by 2.9% (95% CI = 1.00-1.06).

Table 65: The relationship of breastfeeding duration on perceived changes in breast shape on week 52

Breastfeeding duration	Breast shape changes reported at Week 52	
	Crude OR (95% CI)	**Adjusted OR* (95% CI)**
Exclusive breastfeeding for; 6 months	**1.040 (1.01-1.07)**	1.035 (1.00-1.07)
Any breastfeeding for; 6 months	**1.040 (1.02-1.06)**	**1.038 (1.01-1.07)**
12 months	1.011 (1.00-1.02)	1.008 (1.00-1.02)
Full breastfeeding for; 6 months	**1.034 (1.01-1.06)**	1.029 (1.00-1.06)
12 months	**1.034 (1.01-1.06)**	1.029 (1.00-1.06)

*Adjusted Odds Ratio (OR) was obtained based on multiple logistic regression with covariates including mothers' age, mothers' health status during the feeding period, mothers' working status after birth, age by which the dummy was introduced, mother demand feeding, mothers' Iowa score, and if they express breastmilk.

- -2 log likelihood (deviance) 379.624, d.f = 2 (6 month exclusive breastfeeding duration)
- -2 log likelihood (deviance) 387.490, d.f = 2 (6 month any breastfeeding duration)
- -2 log likelihood (deviance) 394.270, d.f = 2 (12 month any breastfeeding duration)
- -2 log likelihood (deviance) 391.891, d.f = 2 (6 month fully breastfeeding duration)
- -2 log likelihood (deviance) 391.793, d.f = 2 (12 month any breastfeeding duration)
- All variables of interested were included in the full model in the initial step and then backward elimination procedure was applied to obtain the final model, using 5% critical value of χ^2 test for the appropriate degrees of freedom.

The women's perceptions on the effect of breastfeeding on their breast shapes at four weeks postpartum were incorporated into a Cox logistic regression model. All perceived changes in breast shape combined into a group and three groups were used for this analysis: A) changes B) not sure, and C) no changes. Significant factors affecting breastfeeding duration for six months and 12 months which were reported by the study (Scott, et al., 2006) were included as covariates. However, no significant associations with any types of breastfeeding for six months or 12 months given an impact on the perceptions of breast shape were found after adjustments (Table 66).

Table 66: The association between perceived changed in breast shape at week 4 and the duration of breastfeeding for 6 months or 12 months

Breastfeeding type	Perceptions	Duration of breastfeeding			
		6 months		12 months	
		Crude HR (95% CI)	Adjusted HR† (95% CI)	Crude HR (95% CI)	Adjusted HR† (95% CI)
Exclusive	No change	1.00 (reference)	1.00 (reference)	N/A**	N/A**
	Not Sure	1.39 (1.07-1.81)	1.17 (0.79-1.71)		
	Changes*	1.107 (0.86-1.42)	1.104 (0.78-1.56)		
Any	No change	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
	Not Sure	1.12 (0.78-1.60)	0.72 (0.41-1.26)	1.19 (0.88-1.62)	0.84 (0.53-1.33)
	Changes*	0.936 (0.66-1.32)	0.991 (0.59-1.67)	1.096 (0.82-1.46)	1.107 (0.72-1.70)
Full	No change	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
	Not Sure	1.25 (0.92-1.70)	1.17 (0.74-1.84)	1.21 (0.93-1.58)	1.07 (0.74-1.55)
	Changes*	1.08 (0.81-1.44)	1.13 (0.74-1.72)	1.05 (0.82-1.35)	0.97 (0.69-1.36)

* Changes include all perceived changes.

** N/A = Not Applicable

† Adjusted Hazard Ratio (HR) was obtained based on a multiple Cox regression with covariates including mothers' age, mothers' education level, mothers' occupation, mothers' country of birth, mothers' marital status, if mother attended an antenatal class on feedings, mothers' health status during the feeding period, maternal grandmother feeding preference, baby birth weight, parity, father feeding preference, mothers' working status after birth, age by which the dummy was introduced, when the breastfeeding decisions were made, breastfeeding problems, infants' gender, infant submitted special care nursery, mother demand feeding, mothers' Iowa score, and if they express breastmilk.

- All variables of interested were included in the full model in the initial step and then backward elimination procedure was applied to obtain the final model, using 5% critical value of χ^2 test for the appropriate degrees of freedom.

- -2 log likelihood (deviance) of exclusive breastfeeding, 2945.194, d.f = 15 (6 month duration)
- -2 log likelihood (deviance) of any breastfeeding, 1379.624, d.f = 13 (6 month duration)
- -2 log likelihood (deviance) of any breastfeeding, 2132.074, d.f = 14 (12 month duration)
- -2 log likelihood (deviance) of full breastfeeding, 2088.086, d.f = 11 (6 month duration)
- -2 log likelihood (deviance) of full breastfeeding, 2974.734, d.f = 9 (12 month duration)

In short, the longer a woman breastfeeds, the more the women is likely to notice changes in her breast shape at 52 weeks in Australia. Although the postpartum women might believe that changes in their breast shape might occur, this reason itself did not outweigh the benefits for their infants and did not lead them to discontinuing breastfeeding.

4.8 Summary

In this chapter, the results from the Australian cohort study (PIFS II) investigating infant feeding practices and postpartum women's perceptions about changes in their breast shape due to breastfeeding in relation to breastfeeding duration were reported in detail. Demographic factors presented that the most of the respondents in the PIFS II were around 30 years old with 'normal' range of their BMI, Australian born, multiparous by vaginal delivers, and employed with stable annual income. Their husbands/partners were also employed. More half of the respondents decided how to feed their infants before pregnancy and their knowledge and attitudes towards infant feeding methods were positively supported breastfeeding. Their husbands/own mothers were also supportive towards breastfeeding. However, the duration of breastfeeding for six months remained low and was affected by several factors including maternal smoking status and employment status. Postpartum women's body image particularly, their perceived body weight and breast shape were various. Some believed the continuation of breastfeeding helped their weight loss, but made their breast shape changes. When these perceptions at 52 weeks postpartum took into the multivariate analysis, no significant was found these perceptions in relation to breastfeeding outcomes.

Part 3: The differences of infant feeding practices between the Japanese and Australian women

The results in part three provide comparisons between the results of the infant feeding studies undertaken in Japan and in Australia in order to study postpartum women's body image related to breastfeeding outcomes in the two different cultures. These comparisons will increase knowledge about breastfeeding outcomes and may assist in developing appropriate health promotion programs. Although these studies had different study designs, it is possible to compare the prevalence of 'any breastfeeding' to six months postpartum and associated risk factors. The average score of the Iowa Infant Feeding Attitudes Scale (IIFAS) and the descriptions of postpartum women's body image will be also compared.

4.9 Breastfeeding outcomes

Table 67 identifies the proportion of the postpartum women who achieved 'any breastfeeding' and 'full breastfeeding' for six months of age in the Australian and Japanese studies. In the Japanese study, more women continued 'any breastfeeding' to six months of age, compared to the Australian women in the PIFSII study. Furthermore, the prevalence of 'full breastfeeding' in Australia was very small, which contrasted with Japan where 23.8% of Japanese postpartum women were able to fully breastfeed their infants for six months of life.

Table 67: The prevalence of breastfeeding ('any' and 'full') at six months in Japanese (Himeji study) and Australian respondents (PIFS II)

Feeding methods	Himeji study (%) (n = 1,612)	PIFS II (%) (n = 587)
'Any breastfeeding' 6 months (24weeks)	61.8	49.4
'Full breastfeeding' 6 months (24weeks)	23.8	3.4

Figure 15 is a comparison of the time periods when decisions were made about infant feeding methods between the respondents in the PIFS II and in Himeji study in

Japan. The Australian was more likely to decide either before or during early pregnancy, than the Japanese respondents.

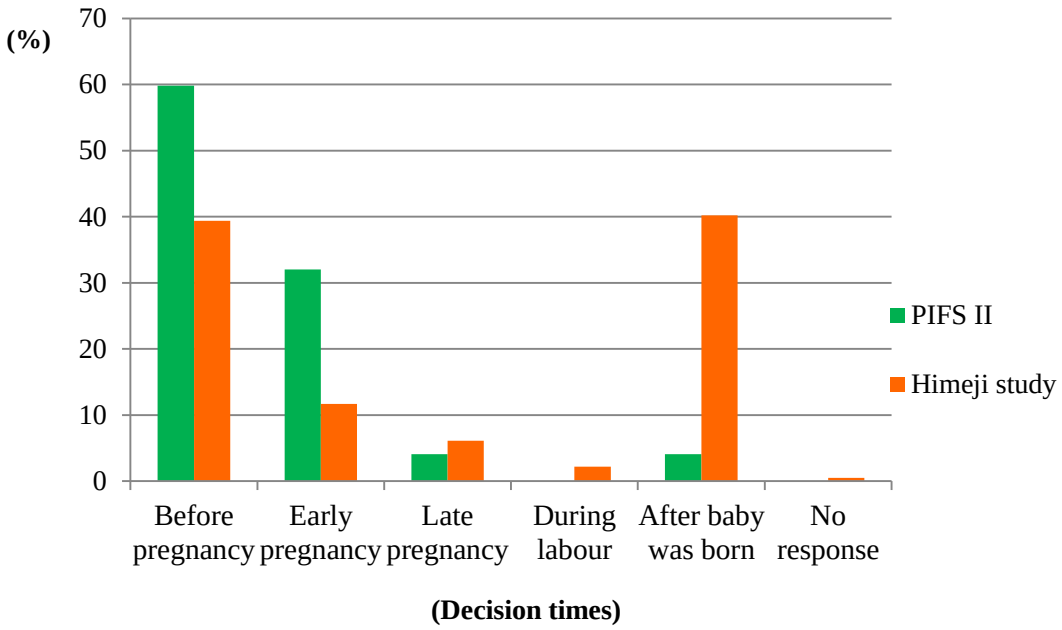


Figure 15: Comparisons of the time when mothers decided about infant feeding methods between mothers in Himeji (n = 1,612) and in the PIFS II (n = 587)

Table 68 compares beliefs and experiences of family members on infant feeding methods as described by the women in Japan and Australia. Nearly 65% of the husbands in Japan were ambiguous in their opinion about infant feeding methods, but more than half of Australian husbands/partners had firmer opinions, and were positively supportive towards breastfeeding. The Australian respondents were less likely to discuss their choice of infant feeding methods with their own mothers. The Japanese women's own mothers (grandmothers of infants) were more likely to positively support infant formula feeding. Moreover, more than half (53.7%) had not breastfed their own infants, which was a higher proportion than the Australian women's own mothers (grandmothers of infants) (14.5%).

Table 68: Beliefs and experiences of family member on infant feeding methods cited by respondents in Japan (n = 1,612) and Australia (n = 587)

Beliefs or experiences of infant feeding methods	Countries	
	Japan	Australia
	n (%)	n (%)
Husbands'/partners' preferences of infant feeding methods		
Breastfeeding	304 (18.9)	314 (53.4)
Bottle feeding	30 (1.9)	8 (1.4)
Do not mind	1045(64.8)	211 (35.9)
Never discussed	227 (14.1)	54 (9.2)
Not responded	6 (0.4)	0 (0.0)
Women's own mothers (grandmothers of infants) preferences infant feeding methods		
Breastfeeding	527 (32.7)	198 (33.7)
Bottle feeding	64 (4.0)	6 (1.0)
Do not mind	879 (54.5)	247 (42.1)
Never discussed	136 (8.4)	134 (22.8)
Not responded	6(0.4)	2 (0.3)
Women's own mothers (grandmothers of infants) experiences of breastfeeding		
Yes	487 (29.7)	446 (76.0)
No	866 (53.7)	85 (14.5)
Don't know	260 (16.1)	53 (9.0)
Not responded	8 (0.5)	3 (0.5)

4.10 The Iowa Infant Feeding Attitudes Scale (IIFAS)

Table 69 presents the average score of the IIFAS for Australian and Japanese women. Although the average scores in both groups were in the 'Neutral' range, there was an approximately 10-points gap between the scores of the two studies. This indicates that the Australian women showed more favourable attitudes towards breastfeeding than the Japanese counterparts.

Table 69: A comparison of the total score of the IIFAS between the PIFS II and the Himeji study

IIFAS score	Himeji study (n = 1,612)	PIFS II (n = 587)
Mean ± Standard Deviation	54.2 ± 4.9	64.4 ± 8.3

Figure 16 shows a comparison of the proportion (%) of the postpartum women who 'agreed' with the each item in the IIFAS for the two populations. The majority in both groups accepted the advantages of breastfeeding, which included 'an establishment of attachment' (Item 3), 'an ideal food for infants' (Item 12), and 'a

cost performance of breastfeeding' (Item 16). While more than half of the Australian women accepted 'the convenience of breastfeeding', fewer than 10% of Japanese mothers agreed with this item (Item 15). More than half of the Japanese women believed that 'infant formula is as healthy as breastfeeding' (Item14), compared to less than 20% of Australian counterparts who agreed with this item. In fact, the proportion of the respondents who 'agreed' with the Item 9 was higher in Australia than in Japan.

In contrast, nearly two thirds of the Japanese women disagreed with the 'convenience' (Item 15) and 'enjoyment' (Item 7) in breastfeeding (Figure 17). In Australian women, more than two thirds of them disagreed with the reverse question of this item 'convenience' (Item 2). Australian respondents were more likely to give affirmative answers towards alcohol intake during breastfeeding than Japanese counterparts (Item 17).

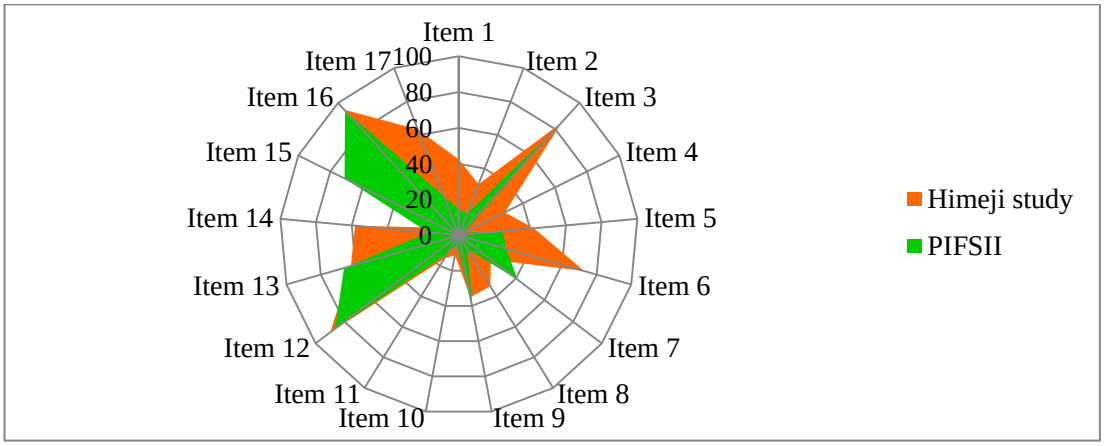


Figure 16: Comparisons of the proportion (%) of the women who 'agree' with the item* in the IIFAS between Himeji study and PIFS II

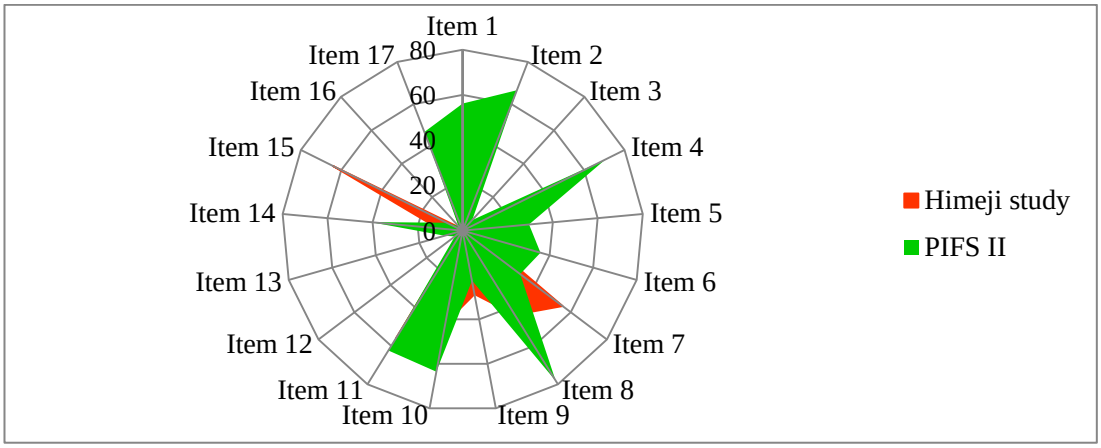


Figure 17: Comparisons of the proportion (%) of the women who 'disagree' with the item* in the IIFAS between Himeji study and PIFS II

*Item 1. The nutritional benefit of breastmilk last only until the baby is weaned from breastmilk
2. Formula feeding is more convenient than breastfeeding
3. Breastfeeding increases mother-infant bonding
4. Breastmilk is lacking in iron
5. Formula-fed babies are more likely to be overfed than breastfed babies
6. Formula feeding is the better choice if mother plans to work outside the home
7. Mothers who formula feed miss one of the joys of motherhood
8. Women should not breastfeed in public places such as restaurants
9. Breast fed babies are healthier than formula fed babies
10. Breast fed babies are more likely to be overfed than formula fed babies
11. Father feels left out if mother breast feeds
12. Breastmilk is the ideal food for infants
13. Breastmilk is more easily digested than formula
14. Formula is as healthy for an infant as breastmilk
15. Breastfeeding is more convenient than formula feeding
16. Breastfeeding is less expensive than formula
17. A mother who occasionally drinks alcohol should not breastfeed her baby

The reported maternal BMI before the first pregnancy showed that the rate of 'underweight' in Japanese women was higher than in their Australian counterparts. The respondents in both studies thought that breastfeeding would help them lose their weight after delivery (57.2% for Japanese women at 18 months postpartum vs. 26.4% for Australian women at 12 months postpartum). In addition, they perceived that their breast shape had changed due to breastfeeding. These changes were described in the several ways. Compared with their breast shape pre-pregnancy, 'breast sagging' was the most common change in both studies (62.8% of the Japanese women at 18 months postpartum vs.28.4% of the Australian women at 12 months postpartum). Perceived changes in breast size, particular becoming smaller was also common among the women (61.7% of the Japanese and 20.6% of the Australian).

For the Australian women, there was no significant impact of their perceptions of changes in their breast shape on likelihood of breastfeeding to six months postpartum (after adjusting for potential confounders). By contrast, Japanese women were more like to have a significantly shorter duration of breastfeeding if they perceived that changes in their breast shape were occurring (see Table 45). The higher proportion of the mothers in Japan suggests that they are more conscious of their body size and shape than in Australia and that this affects the duration of 'any breastfeeding' to six months postpartum in Japan.

4.11 Factors associating with the duration of 'any breastfeeding' to six months postpartum in Japan and Australia

Comparisons of the factors that have positively and negatively associated with the duration of 'any breastfeeding' in the two studies are presented in Table 70. Maternal age, pre-pregnancy decision to breastfeed their infants, maternal employment status, and maternal smoking status were commonly found to be significant factors that were associated with the duration of 'any breastfeeding' in both studies. However, factors of alcohol consumption and perceptions of breast shape changes had different results in the two studies. In the Japanese study, alcohol consumption was positively associated with the duration of 'any breastfeeding'. However, this was not the case in the PIFS II. In the Japanese study the IIFAS score was significantly associated with 'any breastfeeding' to six months postpartum, if the factors related to women's body images were excluded. However this association became insignificant after adjusting for the confounders. The husbands' and women's own mothers; preferences about infant feeding methods were not statistically significant in the Japanese study, while these showed a positive association with the duration of 'any breastfeeding' in the Australian study (PIFS II). The maternal perceptions of changes in breast shape were associated with the duration of 'any breastfeeding' in the Japan study, but this factor was insignificant in the PIFS II.

Table 70: Comparisons of the factors that were associated with the duration of 'any breastfeeding' to six months postpartum between the Himeji and the PIFSII

Factors*	**The duration of 'any breastfeeding' to six months postpartum**	
	Himeji study	**PIFS II**
Younger age of mothers	N.S	−
Pre-pregnancy decision to breastfeed	+	+
Maternal smoking status	−	−
Maternal employment status/return to paid work	−	−
Alcohol consumption during breastfeeding	+	−
Perceived changes on breast shape	−	N/A
Primipara	+	N.S
Breastfeeding problems	−	−
Breastmilk as the first foods given to infants	+	N.S
Attendance at antenatal classes	N/A	+
Husbands'/partners' preferences to breastfeeding	N.S	+
Women's own mothers' preferences to breastfeeding	N.S	+

IIFAS score	N.S	+
Late commencement of infant formula	+	N/A
Dummy/Pacifier usage	N/A	−

*-: indicates negative factors, +: indicates positive factors, blank: indicates not significant, N/A: not applicable, which was not included in the questionnaire, and N.S: not statistically significant
Source of the PIFS II:(Scott, et al., 2006)

4.12 Summary

Because similar questionnaires were used in the two studies, in Japan and Australia, several outcomes could be compared between the different cultures. Compared with Japanese women, the Australian women had more favourable attitudes towards breastfeeding and perceived more support from their husbands/partners about breastfeeding. Despite this, the proportion of the women who continued 'any breastfeeding' at six months postpartum was higher in Japanese women than their Australian counterparts. The factors that affected the duration of 'any breastfeeding' were similar in both two studies. In addition, many women in both groups perceived their body weight and breast shape had changed as a result of breastfeeding, but Japanese women were significantly more conscious about these aspects than their Australian counterparts. These comparisons will be discussed in the next chapter.

Chapter 5: Discussion and limitations

In this chapter, the results presented above are discussed in relation to the aims of the study, which are to describe the infant feeding practices in Japan, and to analyse postpartum women's body image in relation to breastfeeding outcomes in Japan and Australia. This chapter is divided into two parts. Part one: The Japanese infants feeding study, and part two: Postpartum women's body image association with breastfeeding outcomes in Japan and Australia. Main findings in the Japanese study are interpreted and discussed with comparisons made to the Perth Infant Feeding Study Mark II (PIFS II) in terms of ethnic and cultural perspectives. In addition, the strengths and limitations of the study are provided.

Part 1: The Japanese infant feeding study

5.1 Sample characteristics in Himeji, Japan

The characteristics of the respondents in Himeji were generally representative of postpartum women in Japan, based on comparisons with the Japanese National statistics. In 2010, the average age of women when delivering their first child was 29.9 years (Ministry of Health Labour and Welfare, 2010c), compared to 29.4 years for primipara in this study. The National statistics also reported that for Japanese women, their early 30s was the most common age for childbearing which was consisted with the average age of the respondents in this study; 32.2 years. Caesarean sections were 23% at hospitals and 13% at clinics for Japan in 2008 (Ministry of Health Labour and Welfare, 2008b), compared to 14.9% including both facilities in this study. Japanese women who have a caesarean section usually do so for a medical indication. In this study, 10.6% of the respondents were smokers, compared to 14.3% and 18.0% in their 20s and 30s for whole country, although these latter figures are for all women and not just women who were pregnant (Ministery of Health Labour and Welfare, 2010). Although the number of working women has increased to the highest level of employment ever reported, the number of unemployed women has also risen (Ministry of Health Labour and Welfare, 2010d). The 35-39 age group has the lowest rate of female labour force with participation at

65.6% (Ministry of Health Labour and Welfare, 2010d). The second lowest rate of labour force was the in the 30-34 age group at 67.2%, although this group has had the highest growth rate since 1968 (Ministry of Health Labour and Welfare, 2010d). In the present study, the majority of the respondents in their early 30s (71.4%) was unemployed, which was consistent with the National trend. Male/female ratio of this current study was 0.99, which was different from the National statistics, 1.06 in 2010 (Ministry of Health Labour and Welfare, 2010c). The rate of low birth weight has been steadily increasing in the past two decades. It was 8.4% in this study, which was lower than the National rate by 9.5% in 2010 (Boshi Hoken Jigyoudan, 2011). According to the National report in 2008, the average of annual income in 30s was 5,624,000 JP¥ (equivalent value in AU$, approximately 66000) (Ministry of Health Labour and Welfare, 2009b). Compared with the National statistics, the annual income given by the respondents was slightly lower.

5.2 Breastfeeding outcomes in Himeji, Japan

5.2.1 The timing of the decision to breastfeed

This was the first detailed study that investigated breastfeeding outcomes including the Iowa Infant Feeding Attitudes Scale (IIFAS) in Japan. In the present study, about 55% of the respondents decided their infant's feeding method before or during pregnancy, which was consistent with, but was a lower proportion than the National report on Breastfeeding and Weaning (Ministry of Health Labour and Welfare, 2007). This report stated that more than 95% of Japanese women wished to breastfeed their infants before delivery and 43.1% intended to exclusively breastfeed their infants (Ministry of Health Labour and Welfare, 2007). The earlier the decisions about infant feeding methods were made by women, the longer the duration of breastfeeding has been reported in other studies (Donath & Amir, 2003; Forster, et al., 2006). The present study also found that the respondents who had made an early decision on infant feeding methods were statistically associated with 'any breastfeeding' to six months postpartum. Nevertheless, nearly 40% still decided infant feeding methods after their infant(s) had been born. This prevalence was about 10 times larger than in the PIFS II from Australia. In order to increase the breastfeeding rate, future interventions could include more prenatal education, but

there is a need to consider when it should be provided and the area of content. Prenatal education on breastfeeding is essential for women to understand the differences between breastmilk and infant formula, and the reasons why breastmilk is the most recommendable food for infants that includes benefits with short and long terms. The PIFS II also found that prenatal education was found to have a positive impact on breastfeeding prevalence (Binns, et al., 2005). These studies suggest that women should be encouraged to decide about 'exclusive breastfeeding' either before or an early stage of their pregnancy.

5.2.2 Prelacteal and early supplemental feeding

The present study showed that nearly 30% and 20% of the infants were first fed by infant formula and glucose water, respectively. A further 6% of the respondents did not know what their infants were fed while in hospital. Overall, more than 50% of the Japanese infants' first feed were not breastmilk, which meant that they were not exclusively breastfed. Compared with the Australian study, the PIFS II, this prevalence is much higher. Although the hospitals that participated in the PIFS II were not the 'baby friendly' ones, nearly 85% of the Australian respondents stated that breastmilk was the first food given to their infants. This finding was the one of the biggest differences between the two studies, indicating the much lower initiation rate of breastmilk as the first feed in Japan than in Australia. A delay of the initiation in breastfeeding has been linked with a shorter duration of breastfeeding. A study of 318 Japanese women found that delayed initiation of breastfeeding more than 120 minutes after birth was found to be statistically associated with negative impacts on breastfeeding duration at four months postpartum (OR = 2.45, 95% CI = 1.21-4.95, p = 0.01) (Nakao, et al., 2008). Not giving breastmilk at the first feed, which is not recommended by WHO, was often ordered by health professionals in the Japanese hospitals. A Japanese study of 41 obstetric facilities including hospitals and clinics in the Okinawa prefecture (approximately 47% of the total number of the obstetric facilities) showed that only eight facilities (19.5%) routinely gave nothing to infants after birth except breastmilk from their own mothers. Nearly half of the facilities (19 facilities, or 46.3%) gave infant formula or glucose to infants while in hospital and five facilities (12.1%) gave these prelacteal feedings immediately after birth (Nakamura, 2002). Accordingly, much breastfeeding in Japan fits into the WHO definition of 'full' or 'any breastfeeding' and not 'exclusive breastfeeding', although

it is often reported as ‘exclusive breastfeeding’. Some studies have argued that giving glucose as the first feed for infants prevents neonatal hypoglycaemia that may affect the neurological problems later in life (Boluyt, van Kempen, & Offringa, 2006; Nakai & Hamasaki, 2009). However, Walker (2011a) stated that infant formula particularly, cow’s milk based formula and glucose water were the last choice when infants needed supplementary or prelacteal feeding. In the multivariate analysis of this present study, the giving breastmilk as their first food while in hospital was found to be a significant factor that was inversely associated with ‘any breastfeeding’ duration to six months postpartum.

Furthermore, approximately 20% of the Japanese respondents introduced infant formula within seven days after birth. This usage rate increased to nearly 88% by four weeks postpartum, showing that ‘any breastfeeding’ was the most common feeding method in Japan. In the PIFS II, the prevalence of introduction of infant formula by about four weeks postpartum was less than 40%. The ‘any breastfeeding’ rate at six months postpartum in Japan was more than 62% compared to Australia at 49%. However, it is important to remember that the Japanese infants were less likely to be exclusively breastfed at any age, compared to the Australian infants. In the PIFS II, the prevalence of ‘exclusive breastfeeding’ was about 33% at four weeks postpartum. In contrast, only 12% of the infants in Japan can be counted as either ‘full’ or ‘exclusive’ breastfeeding at the same time point. These breastfeeding practices observed in Japan are reflected in the smaller number of hospitals and obstetrics clinics with the ‘Baby Friendly Hospital Initiative’ (BFHI) accreditation status, compared to other developed countries (World Health Organization, UNICEF, & Wellstart International, 2009). Up to 2011, there are only 61 (2%) ‘Baby Friendly Hospitals’ out of over 3000 hospitals and obstetrics clinics in Japan (Japan Breastfeeding Association, 2010). The routine use of supplemental and prelacteal infant formula feeds is not consistent with best practice (Saadeh & Akre, 1996) and thus should be discouraged because of interference with lactogenesis. The use of prelacteal feeds increases the risk of infections and also may induce changes in the developing human microbiome in infants (American Academy of Pediatrics Work group on breastfeeding, 1997; Paricio Talayero et al., 2006). However, having some breastmilk, ‘any breastfeeding’ is better for infants than receiving only infant formula. Even if postpartum women have to use some supplemental infant formula,

it is better to continue breastfeeding as much as possible. The infants should be breastfed first as early suckling stimulates and then increases breastmilk production.

While the mean duration of 'any breastfeeding' in the present study was about nine months, which was greater than in Australia, the present study indicated that the use of infant formula was widespread in Japan. While the 'International Code of Marketing of Breastmilk Substitutes' by WHO has been more emphasised in recent practice, many hospitals and obstetric clinics still accept donations of infant formula and equipment from infant formula companies. Moreover, samples are sometimes distributed to new mothers while in hospital. Howard et al. (2000) reported that mothers who received goods from formula companies were more likely to cease breastfeeding within two weeks after birth, compared with those who did not receive gifts. Aggressive marketing strategies by infant formula companies affect knowledge and attitudes towards breastfeeding of not only women but also health professionals. A Japanese survey of 151 midwives who attended an academic conference showed that more than 45% considered that the practice of teaching new mothers to prepare infant formula not to be an obstacle of breastfeeding and 32 % stated that providing free gifts of infant formula would not impede breastfeeding practices (Awano, et al., 2003). Mizuno et al. (2006) also reported that paediatricians (n = 90) were more aware of the importance of breastmilk than obstetricians (n = 62) (66% vs. 13%) and the WHO marketing code was likewise (51% vs. 18%). Their inappropriate information, insufficient understanding and inconsistent suggestions of breastfeeding issues may often make women confused and reluctant to continue breastfeeding.

Support from health professionals is essential for postpartum women to continue breastfeeding. Kaneko et al. (2006) showed that the postpartum women who had professional advisors or peer support with childcare increased the duration of 'exclusive breastfeeding' (adjusted OR = 0.95, 95% CI = 0.84-1.07 for professional support; adjusted OR = 1.25, 95% CI = 1.14-1.37 for peer support). Health professionals, through their attitudes and knowledge can positively and also negatively influence the postpartum women's motivation to continue breastfeeding. Therefore, breastfeeding education presenting accurate knowledge is important for health professionals to increase their awareness of breastfeeding practices and to deal with common concerns of the women. This will also protect postpartum women

from confusion resulting from inconsistent information and advice in breastfeeding. In the Centre for Disease Control (CDC) in USA, the Guide to breastfeeding interventions stated that breastfeeding education to health care professionals will be a crucial component for successful interventions (Shealy, Li, Benton-Davis, & Grummer-Strawn, 2005).

5.2.3 Iowa Infant Feeding Attitude Scale (IIFAS)

The IIFAS was used in the present study to assess breastfeeding knowledge and attitudes towards breastfeeding in Japan. While the Japanese respondents had some knowledge of breastfeeding, their overall knowledge and attitudes towards breastfeeding were more positive towards the use of infant formula. More than half of them stated that 'infant formula was as healthy for infants as breastmilk'. The Japanese respondents believed that infant formula was almost the same nutritional components as breastmilk and would not be harmful to their infants. However, the components of breastmilk vary from the stage of lactogenesis, maturity, and infants' environment/age in months and these changes are congruent with infants' nutritional needs as they grow older (World Health Organization, 2000). In contrast, there is only one type of infant formula in Japan for all newborn and infants. Moreover, there is no substitute for nutrients in breastmilk.

Respondents with a higher score of the IIFAS were more likely to breastfeed to six months postpartum than those who had a lower score and conclusions are the same as several studies undertaken in different cultures (Ho & McGrath, 2011; Scott, et al., 2001). This finding will be useful information for health professional allowing them to select the target groups that may benefit from further breastfeeding education. This finding also shows that breastfeeding outcomes are affected by cultural beliefs. The positive relationship between the IIFAS score and the duration of 'any breastfeeding' was seen in the first model. However, after entering the factors related to the women's body image, the IIFAS became insignificant, suggesting that the IIFAS is a confounder when you focused on the breastfeeding outcomes related to postpartum women's body image.

The IIFAS has been widely used in many countries including all major European countries and in Asia including China and Malaysia. There are no reports of its previous use in Japan. Cronbach's alpha level is calculated to identify internal

consistency of the measurement scale (Cronbach & Warrington, 1951). The Cronbach's alpha level of the reliability of the IIFAS in the Japanese study was 0.46, which is a level for moderate reliability according to the criteria for the values of Cronbach's alpha level given by Nunnally et al. (Nunnally & Bernstein, 1994). Following this initial Japanese study it may be possible to make some culturally relevant adjustments to the scale and retest on a different sample. Cultural beliefs and thoughts are involved in the process of decision-making on infant feeding methods (Battersby, 2010; Bentley, Dee, & Jensen, 2003; Swanson & Power, 2005). Studies of opinions and knowledge of breastfeeding is important to understand influences women's decisions on breastfeeding in order to improve breastfeeding promotion programs and so the use of the IIFAS or another similar scale would be very useful in improving breastfeeding in Japan.

The Japanese IIFAS total score of 54.1(SD = 4.92) was lower than other countries where studies have been undertaken. This includes the United Kingdom, 65.0 (SD = 8.3) (Shaker, Scott, & Reid, 2004), Northern Ireland, 65.2 (SD = 8.57) (Sittlington, Stewart-Knox, Wright, Bradbury, & Scott, 2007), Taiwan, 65.6 (SD = 7.1) (Ho, 2010), Romania, 68.4 (Standard Error = 2.6) (Wallis et al., 2008), and Australia (PIFS II), 64.4 (SD = 8.3) (Binns, et al., 2005). Some items in the IIFAS showed that approximately 30% of Japanese respondents perceived 'formula feeding to be more convenient than breastfeeding', which was higher than other studies in Scotland by 17% (Shaker, et al., 2004), in Australia (PIFS II) by 5% (Binns, et al., 2005) , and even among Japanese women residing in Australia by 15 % (Utaka, et al., 2005). Moreover, less than quarter of the Japanese respondents (22.4%) agreed that 'the use of infant formula missed the joys of motherhood'. This was again a lower proportion than in Northern Ireland (66.1%) (Zhou, Younger, & Kearney, 2010) and in Saudi Arabia (49%) (Al-Madani, Vydelingum, & Lawrence, 2010). This comparison of international of IIFAS scores shows that the Japanese women have lower level of breastfeeding knowledge when compared with postpartum women in other countries. This might be one of the reasons why Japanese women introduce infant formula at an earlier stage than do women in other countries. A survey of Japanese women found that the majority of them wanted to breastfeed their infants (Ministry of Health Labour and Welfare, 2007). The finding of the present

study showed that Japanese women needed more education about breastfeeding issues and disadvantages of using infant formula.

In Japan, however, postpartum women usually stay in hospital for approximately five to seven days after delivery and this length of stay is longer than other countries (Awano, et al., 2003). While in hospitals, they must receive advice and information in breastfeeding. In fact, the National report showed that the more than half of the women received education on breastfeeding either before or after delivery (63.1% and 67.9%, respectively) (Ministry of Health Labour and Welfare, 2007). Although many of them received breastfeeding education while in hospitals, those women who immediately introduced infant formula after discharge might have encountered difficulties while at home that made them decided that breastfeeding was too difficult and burdensome to continue. Japanese women might have to cope with problems related to breastfeeding alone without any support.

5.2.4 Breastfeeding problems

Breastfeeding problems were reported by 62% of the respondents in the Japanese study. The most common problem was 'insufficient breastmilk production' described by 25%, following 'cracked or sore nipples' by 21%. In the PIFS II, 'insufficient breastmilk production' was also a common problem throughout the first year. It is important to distinguish between physiological deficiencies and perceived temporary insufficient breastmilk supply. While the number of postpartum women who had the physiological deficiencies of breastmilk was small, the reported rate varies between studies (Power, 2010). 'Insufficient breastmilk production' is the most common reported for postpartum women not breastfeeding their infants in many countries (Binns & Scott, 2002a; Li, Fein, Chen, & Grummer-Strawn, 2008; Utaka, et al., 2005). In the present study, 20% of the Japanese respondents gave this as the reason when they decided to terminate breastfeeding. It is common for them to suspect the adequacy of breastmilk. This often occurs when the infant has constantly cried or is unsettled (Binns & Scott, 2002a; Yamamoto, et al., 2009). The data of the PIFS II showed that some mothers often made incorrect self-judgments and interpretations about infant behaviours that were unfavourable or unexpected for them (Binns & Scott, 2002a). Accordingly, many postpartum women started adding infant formula. In Japan, infant formula is often introduced when infants are thought

to have insufficient weight gain. This is sometimes associated with women's perception of insufficient breastmilk production (Binns & Scott, 2002a). Moreover, health professionals suggest adding infant formula based on their assessment of the adequacy of breastfeeding (Kato, 1998). Assessment of inadequate breastmilk production is usually made using the growth rate over a period of time using the criteria of several guidelines the Japan Paediatric Society. A Japanese longitudinal study by Kato (1998) found that exclusively breastfed infants (Boys = 99, Girls = 75) for 12 months were significantly heavier than those who exclusively breastfed for only one month (Boys = 89. Girls = 73) and for three months (Boys = 59, Girls = 65). Weight gain of infants needs to be assessed over a period of time. Power (2010) stated that perceived 'insufficient breastmilk production' by postpartum women is a complicated problem, which is triggered by many factors. Postpartum women and their infants should be assessed together to find out the factors that lead to perceived 'insufficient breastmilk production'.

'Cracked or sore nipples' was the second most common problem but this was not the final reason for discontinuation of breastfeeding. A study of 163 Japanese women living in Australia found that 6.9% of them cited 'nipple soreness' as a reason for stopping breastfeeding (Utaka, et al., 2005). In the Australian study (PIFSII), 'cracked or sore nipples' was also reported at beginning of lactation periods by about 56% of women and this was then decreased with postpartum weeks (Binns, et al., 2005). Positioning and attachment technique were related to this problem and early intervention and on-going support on breastfeeding problems should be provided for postpartum women before and after discharge (Binns, et al., 2005). By addressing these breastfeeding problems in prenatal or postnatal classes, they will be able to image what happened to her body and how to deal with these problems. Binns and Scott (2002a) stated that the managements of breastfeeding problems were not difficult, but health professionals and the women must understand the problems. Correct management will increase women's confidence towards breastfeeding, which is also a factor that influences the duration of breastfeeding.

5.2.5 Family's preferences towards infant feeding methods

The most common reason for choosing breastfeeding was 'better for infant' and this was no different from studies in many other countries including Australia (Brodribb,

Fallon, Hegney, & O'Brien, 2007), Maldives (Abdulraheem & Binns, 2007), and Northern Ireland (Sloan, Sneddon, Stewart, & Iwaniec, 2006). However, less involvement of family members including husband and women's own mother in the decisions of infant feeding methods were one of the highlights in this present study.

Less than 20% of the Japanese husbands positively supported breastfeeding, while the majority of the respondents stated that he did not mind about the infant feeding method used. This proportion was much lower than in Australia, the PIFS II (53.5%) (Binns, et al., 2005) and in China (92.5%). 14% of the Japanese respondents had not even discussed infant feeding methods with their husbands, which was again higher than in other countries (PIFS II = 9.2%, China = 0.9%). Previous studies found that the women whose partners actively participated in the decision-making processes on infant feeding methods were more likely to have a longer duration of breastfeeding, compared with those whose partners with passive participations (Binns, et al., 2005; Pisacane, et al., 2005). In a qualitative study, breastfeeding women stated that they were assured and encouraged by their partners in order to continue breastfeeding when facing difficulties (Tohotoa, et al., 2009). As a consequence, these women would regain motivation to continue breastfeeding (Tohotoa, et al., 2009). While active participations of husbands in breastfeeding are important for women to continue breastfeeding, the study result showed that the sexual division of family roles remains strongly entrenched in the Japanese culture. Breastfeeding issues still belong entirely to women as it is understood that she is responsible for the children. A study assessing social support networks found that Japanese postpartum women were less dependent on their husbands as resources on breastfeeding issues including a process of decision-making on infant feeding methods, emotional support, and management of breastfeeding difficulties (Matsubara, Inoue, Tanaka, Murakami, & Matsubara, 2010). Similarly, a cohort study of 908 Japanese postpartum women by Sasaki et al. (2009) showed that the women who exclusively breastfed their infants for four months postpartum were more likely to give a lower score towards support from their husbands than those who did not exclusively breastfeed (74.3 ± 21.7 vs. 77.5 ± 20.5) (mean ± SD), ($p = 0.041$). Sasaki et al. (2009) concluded that the women anticipated husbands' support as visible involvement including preparation of infant formula and helps with feeding by bottles. In a patriarchal culture, a heavy workload is imposed on women at home, and these will be an intolerable burden

during breastfeeding if their husbands do not help them (Duong, 2005). Therefore, husbands' participation is a key for the successful breastfeeding in such culture. However, an Australian study by Tohotoa et al. (2009) found that the husbands themselves were willing to participate in parenting including breastfeeding issues and to find ways of supporting lactating women. However, the information that they had was often insufficient for them to advocate breastfeeding (Tohotoa, et al., 2009).

It is essential for husbands to receive breastfeeding education to understand breastfeeding and their roles as a father. This should be provided by males. Supportive environments where they can talk freely about their concerns and interests in breastfeeding will also increase their participations in the process of decision-making of infant feeding methods. Educating husbands about the management of breastfeeding difficulties that the postpartum women have faced gives a positive impact on the duration of breastfeeding at six months postpartum (Pisacane, et al., 2005).

Moreover, fully paid parenting leave at workplaces requires legislation and can be expensive for governments to provide. While the Japanese government has encouraged men in child caring to take parenting leave and has set to be 10% as a target by 2017, only 1.38% of them took it in 2010, this rate increased from 0.42% in 2002 (Equal Employment Children and Families Bureau Policy devision, 2011). Appropriate support and sharing the workload with husbands will enable postpartum women to reduce their fatigue and anxieties during lactation that were also found to be one of the final reasons for ceasing breastfeeding in this study.

The women's own mothers (grandmothers of infants) more often preferred breastfeeding than the husbands and there were no substantial differences between countries. However, the majority of them also had no opinion. These family's preferences on infant feeding methods were therefore, not statistically associated with the duration of 'any breastfeeding' to six months postpartum. Current generations of grandmothers in Japan are familiar with infant formula use. In the 1970s, breastfeeding rates in Japan reached their lowest level, which meant the highest prevalence of infant formula (Palmer, 1991). Simultaneously, infant formula companies used the advertising slogan 'To become a bright child' in their marketing, and this message suggested that infant formula feeding gave advantages in weight

gain and infant development, which increased their popularity among postpartum women (Palmer, 1991). Indeed, the present Japanese study found that only 30% of the respondents stated that they were breastfed by their own mothers (grandmothers of infants) while the majority of Australian respondents' mothers in the PIFS II (76.7%) had experienced breastfeeding. Many Japanese women's mothers had no or only limited experience of breastfeeding and it would be therefore, difficult for them to give advice or share the experience of breastfeeding with their daughters. While grandmothers' preference on infant feeding methods is an influential factor for women to intend breastfeeding, the grandmothers may easily give an advice to use formula feeding. Moreover, the post-war decline in the Infant Mortality Rate (IMR) from 30.7 in 1960 to two in 2009, the lowest in the world, coincided with increased use of infant formula in Japan (Organisation for Economic Co-operation and Development (OECD), 2011; World Health Organization, 2011). Therefore, Japanese women, their family, and health workers may have inappropriately linked the decrease in the IMR with the availability of infant formula.

The present Japanese study has not investigated husbands' and grandmothers' knowledge and attitudes towards breastfeeding using the IIFAS. However, these factors are also known to strongly influence the women's decisions to breastfeed and the duration of breastfeeding (Kohlhuber, et al., 2008; Kong & Lee, 2004). Further study on this aspect is required to identify challenges of breastfeeding for the future.

5.2.6 Alcohol intake during breastfeeding

More than half of the Japanese respondents agreed that those who occasionally drink alcohol should not breastfeed their infants in the IIFAS. In the questionnaire, only 14% of the respondents answered that they drank alcohol during the breastfeeding period. However, among these respondents, more than 25% stated that there had no particular time for their drinking. While the women had basic knowledge that drinking alcohol during breastfeeding gave potential damages to their infants' health and developments, their detailed knowledge including the impact of alcohol on the breastfed infants, appropriate time, and preferable amount of alcohol intake during lactating were ambiguous. Compared with other countries with similar health status, including the United States (US) and Australia, the detailed information, advice, or guidelines that have focused on the time and amount of alcohol intake during

breastfeeding are not available in Japan. The PIFS II showed that the maternal alcohol consumption negatively affected breastfeeding outcomes (Giglia, et al., 2008). However, the results of the Japanese study found that the respondents who consumed alcohol during breastfeeding were significantly more likely to continue 'any breastfeeding' to six months postpartum, compared to non-drinking ones. This finding is unexpected and is another big difference between the two studies. Knowledge about breastfeeding among the Japanese women seems to be inconsistent and be underrated. Poor knowledge about breastfeeding may increase too optimistic a view of the situation amongst them. As alcohol is a popular means to facilitate communication with others in the Japanese culture and the drinking population in women has increased in recent years (Takano, Nakamura, & Watanabe, 1996) providing accurate information about alcohol intake for postpartum women might make them stressful. Although the current information or guidelines about alcohol intake focused on pregnant women, lactating women are also advised not to drink during breastfeeding (Giglia, 2007). The present Japanese study did not investigate about the amount and type of alcohols consumed, and further study to confirm this result in other areas of Japan is needed. Moreover, a clear guideline of alcohol intake during breastfeeding should be developed and this will be more relevant to breastfeeding practices in Japanese culture.

5.2.7 Smoking prevalence during breastfeeding

In the present study, the prevalence of maternal smoking during breastfeeding was 10.6%. This factor was also identified as a significant factor that had a negative influence on breastfeeding duration to six months postpartum, was and these findings are supported by other studies including the PIFS II (Giglia, et al., 2006a; Kaneko, et al., 2006). However, the prevalence of smoking during breastfeeding in the PIFS II was almost twice as great as in Japan. A Japanese study by Kaneita et al. (2006) of 44,562 postpartum women with infants at six months of age found that the maternal smoking rate during breastfeeding reported by them was 17.1%, which was higher than the present study, and the women were less likely to breastfeed their infants if they smoked inside of their houses (adjusted OR = 0.32, 95% CI = 0.30-0.33, $p < 0.01$). Haku and Onishi (2004) stated that smoking mothers tended to rely more on formula feeding. Many breastfeeding guidelines have recommended lactating women not to smoke as nicotine, a toxic and addictive substance in cigarettes and

tobacco, will present in breastmilk, leading to poor milk ejection reflex and inadequate volume of breastmilk in curbing prolactin levels (Howard & Lawrence, 1998). However, the smoking rate among Japanese women, particularly, women in reproductive age has steadily increased from 16.0% and 14.9% in their 20s and 30s in 1999 to 16.2% and 17.5% in 2009, respectively (Ministry of Health Labour and Welfare, 2010b). These rates are higher than other Asian countries (Ministry of Health Labour and Welfare, 2009a). While these rates were based on the National Survey that focused on single and non-lactating women, the results from the present study indicated that smoking habits by Japanese women negatively influenced on the duration of 'any breastfeeding' to six months postpartum. Breastfeeding would be underrated its importance for infants and postpartum women, themselves.

Moreover, smoking prevalence by the respondents' husbands at 42.4% was higher in our study than in the National data in 2009 at 38.2% (Ministery of Health Labour and Welfare, 2010), but was lower than the study by Kaneita et al. (2006) at 63.5%. It would be common for Japanese postpartum women and their infants to be exposed to passive smoke (Kaneita, et al., 2006). Japan is known to have one of the highest rate in male smoking across the world, although the smoking rate in males has declined from 55.3% in 1989 to 38.2% in 2009 (Ministery of Health Labour and Welfare, 2010). Smoking status of husbands has also known to associate with the cessation of breastfeeding by women at earlier stage after childbirth (Xu, et al., 2010). Kaneko et al. (2006) showed that if the husbands were the only smokers in the family, exclusive breastfeeding duration for six months of life was more likely to be shorter than non-smoking parents (adjusted OR = 0.92, 95% CI = 0.88-0.97). However, this factor was not statistically significant in relation to the 'any breastfeeding' duration to six months postpartum in the present study. While Japanese studies by Kaneko et al. (2006) and Keneita et al. (2006) had large sample sizes with multivariate analysis, there were a limited number of potential confounders including delivery methods and maternal alcohol intake that were included in the present study. Exposure to nicotine has increased the risk of not only Low Birth Weight infants (LBW) but also but also Sudden Infant Death Syndrome (SIDS) (Moon, Horne, & Hauck, 2007). In the present study, the rate of LBW was 8.4%, which was slightly lower than the national Japanese statistics of 9.8% in 2010 (Boshi Hoken Jigyoudan, 2011). Smoking status by the women is not the only cause of the LBW, but it is a potentially preventable

one. While confirmed in other countries the relationship between parental smoking status and breastfeeding duration needs further studies to confirm the results from the present study in other areas of Japan.

5.2.8 Factors that influence 'any breastfeeding' duration to six months postpartum

Some factors: the women who were older, primiparous, had made an early decision about infant feeding methods, and gave solid foods late to their infants were found to have a positive influence on 'any breastfeeding' duration to six months postpartum, while those who were workers and smokers had negative effects. These results were consistent with other studies including the PIFS II (Haughton, et al., 2010; Scott, Aitkin, Binns, & Aroni, 1999). The IIFAS score was also not significantly associated with the duration of breastfeeding in both two studies after adjusting potential confounders. Although, several factors were discussed in the above section with the ethnic and cultural viewpoints, apart from these above factors, some weakness of social support systems could be seen that this might impel lactating women in Japan into a use of infant formula or unpleasant experiences towards breastfeeding. Examples include strategies for supporting working women during the postpartum period.

Returning to work is a common reason given by postpartum women to cease breastfeeding (Arthur, et al., 2003). If they are the main income earner, this trend is more likely (Chatman, et al., 2004). The IIFAS in the present study also showed that more than 70% of the Japanese respondents stated that infant formula was better choice for working women. Due to an increase of number in working mothers in Japan, this will be another key area for improving breastfeeding rates. Paid parenting leave, which was introduced by a regulation by the Japanese government in 1992 (Ministry of Health Labour and Welfare, 2010d) and has shown a positive impact on prevalence of breastfeeding. A Japanese study by Kaneko et al. (2006) found that postpartum women who had full-time jobs and who took childcare leave for more than six months were more likely to continue 'exclusive breastfeeding' to six months than unemployed women (adjusted OR = 1.14, 95% CI= 1.05-1.23). In this study, those who had less than six months of parenting leave or no leave at all had less favourable breastfeeding outcomes (Kaneko, et al., 2006). Although more than 85%

of working women have currently taken the parenting leave, it is also the fact that nearly 70% of women resigned their jobs after their first delivery (Ministry of Health Labour and Welfare, 2010d). Moreover, a flexible working time and an exemption of working overtime are stated in the regulation (Ministry of Health Labour and Welfare, 2010d). These are important strategies for working women to encourage childcare. However, these also do not directly lead to breastfeeding continuation after postpartum women return back to work. In order for postpartum women who work and want to continue breastfeeding, working environments must be friendly. While it is the best way for women to directly breastfeed their infants on demand at workplaces, this is not possible in many workplaces. The present study showed that nearly 70% of the Japanese respondents had experienced about their breastmilk expression. However, this factor was negatively related to the duration of 'any breastfeeding', while this was before adjusting confounders (OR = 0.59, 95% CI = 0.47-0.74). The results also showed that using an electric pump was not popular amongst Japanese women (about 11%). In the PIFS II, the larger numbers of the users of electric pump was observed (about 20%) but there is yet room for improvement. Expressed breastmilk is more beneficial for infants than infant formula. The use of an electric pump at workplaces, a suitable room and equipment for pumping or a loan program of electric pumps from workplaces would be useful for working women while their breastfeeding. An American study focusing on a free loan program of electric pumps for low-income postpartum women, which was undertaken by Meehan et al. (2008) found that the women who used the electric pump on their request were 5.5 times less likely to request infant formula by six months postpartum, compared with those who did not. Support of breastfeeding at the workplace using an electric pump will be an effective intervention to promote longer duration of 'exclusive breastfeeding' for Japanese postpartum women.

In addition, breastfeeding education held at workplaces to not only women but also expectant mothers, fathers, senior mothers and fathers is important in terms of gaining or regaining the up-dated knowledge of breastfeeding, which will increase understanding in breastfeeding. Particularly, the younger generation may lose their interests in becoming a parent. The National report based on the World Value Survey showed that the rate of desiring to have a child for their life amongst Japanese women have declined from 55.7% in 1995 to 43.4% in 2005 (Dentsu,

2005). Nearly 33% of them disagreed with this, which was the highest proportion among 36 countries (Dentsu, 2005). Becoming a parent may be an unimportant value for the young generation in Japan. The Japanese government also reported that they would be more concerned about huge financial costs for childcare and reduction in their own time particularly, if they were working (Symbiotic Society Policy, 2011). By implementing several strategies in breastfeeding promotion at workplaces, the younger generation will be more interested in becoming a parent and seniors will be able to support breastfeeding in the community.

5.3 Summary

In summary, there are several key areas that are important in improving breastfeeding outcomes in Japan. Japanese infant feeding practices are still affected by 'traditional' beliefs and practices among postpartum women, their family, and health professionals. Compared with women in the Australian study (PIFS II), the IIFAS score were lower. However, this study found that the IIFAS could be used as a measure in order to assess postpartum women who were at high risk of ceasing breastfeeding before six months of life. Breastfeeding education should not only be women, but also family, health professionals, workmates, and society to be effective in increasing breastfeeding rates in Japan. Working environments must be improved for postpartum women to continue breastfeeding. The factors that affected the breastfeeding outcomes need to be incorporated into interventions and future studies. These interventions and further study must include cultural components that are relevant in that country: the postpartum women's body image in Japan, which is discussed in the next section.

Part 2: Postpartum women's body image associated with breastfeeding outcomes in Japan and Australia

The second part of this chapter focuses on issues of postpartum women's body image including their perceptions of changes in their weight status and breast shape and associations with breastfeeding outcomes. There are limited numbers of studies on

this topic, while the numbers of women who have concerns about their weight to be reduced and their body shape to be slim has been increasing. Although the two studies, from Japan and Australia, are from distinctive cultures, the results provide an understanding of postpartum women's body image that has influenced their infant feeding practices with different ethnic and cultural backgrounds.

5.4 The sample characteristics in Perth, Western Australia (WA)

The respondents' demographic details in the Perth Infant Feeding Study II (PIFS II) were generally representative of postpartum women in WA. According to the perinatal statistics in WA (Le & Tran, 2008), the highest proportion of women having babies was in the 30-34 years age group of women, 31.6%, compared to 30.3% in the PIFS II. While primiparous women represented 36.8% in the PIFS II this was 41.3% of women for the whole state (Le & Tran, 2008). The majority were Australian born (72.9%) and legally marriage (92.0%) in this present study, which was consistent with the state statistics (74.7% for maternal country of birth and 89.8% for marital status). Nearly 65% completed high school education in the PIFS II, compared with 63% in the National statistics. There were about 29% of the respondents who delivered by a caesarean section in the PIFS II, and the overall rate was 33.3% for WA in 2008 (Le & Tran, 2008). Male/Female ratio was 1.16 in this study, compared with 1.04 by the WA statistics (Le & Tran, 2008). The more respondents in this study delivered infants with greater than 2500g. The rate of low birth weight in WA in 2008 was 6.7%, compared to 2.2% in the PIFS II (Le & Tran, 2008). The employed proportion was 87.2% in the respondents and 90.8% in their husbands/partner in this study, while the participation rate of labour force with 25-34 years old in Australia between 2008 and 2009 was 74.0% in female and 91.9% in male (Le & Tran, 2008).

5.5 Descriptions of changes in body and breast shape

In both studies, the postpartum women perceived some changes in their body and breast shape due to breastfeeding.

5.5.1 Women's Body Mass Index (BMI) and breastfeeding

In the Japanese study, approximately 18% of the women at 18 months postpartum were 'underweight' category (BMI < 18.5 kg/m^2) but before their first pregnancy, this rate has been 23.9%. In 2006, the World Health Organization (WHO) documented that Japan had the highest percentage of 'underweight' in women among developed countries (World Health Organisation, 2006). The Japanese government also reported that the prevalence of 'underweight' assessed by women's BMI has increased from 18.6% in 1987 to 25.2% in 2007 in their 20s, and from 9.5% to 14.0% in their 30s (Ministry of Health Labour and Welfare, 2008a). The prevalence of 'underweight' Japanese women in their 30s increased more rapidly over the past 20 years than for other age groups. This is in contrast to Australia where very a few women are 'underweight' and the rate is decreasing. The prevalence of 'underweight' in women of the PIFS II before their delivery was only 8%. From a study assessing body image of Japanese women in comparison with the women in Korea and the United States, Sugawara et al. (2010) also showed that the highest prevalence of single women with the lowest of BMI were Japanese in their early 30s. Moreover, their BMI has decreased since 1994, which produced a very unique pattern as women's BMI more often increases with their age (Sugawara, et al., 2010). Although women's BMI in their pre-pregnant and postpartum periods were not significantly associated with 'any breastfeeding' to six months postpartum in the Japanese study, there were seen statistically significant relationships between the women who perceived the return of their weight and breast shape, and their BMI. Japanese women paid more attention to their weight status after their delivery. Moreover, more than 50% of the Japanese women at 18 months postpartum agreed that breastfeeding facilitated their efforts to regain their pre-pregnant body figure faster than infant formula. In the Australian study, more than half stated that breastfeeding helped to reduce their weight at four weeks postpartum. However, this rate declined to 26% at 52 weeks postpartum. While these different results might be related to the different duration of 'any breastfeeding' between two countries, the Japanese women seem to have stronger expectations about the breastfeeding effects on their efforts to return to pre-pregnancy weight.

5.5.2 Perceptions of changes in breast shape due to breastfeeding

The respondents were asked about their perceptions of changes in breast shape, particularly, perceived relationships between breastfeeding outcomes and 'sagging' of their breast shape.

In the Australian study (PIFS II), the postpartum women who breastfed for longer periods more often perceived changes in their breast shape at 52 weeks, compared with their perceptions at four weeks, regardless of the breastfeeding type. Moreover, about 36% of them noticed 'sagging' of breast by week 52 and this proportion was similar to the Italian study that reported 33% at 18 months postpartum (Pisacane & Continisio, 2004). By contrast, the prevalence of Japanese women who perceived breast 'sagging' at 18 months postpartum was more than 50% This was higher than not only Australian and Italian study but the Chinese mothers living in Ireland (Zhou, et al., 2010), and the Japanese women living in Perth (Utaka, et al., 2005).

The most popular activity to regain their breast shape among the Japanese women was to wear a special brassiere or underwear chosen by 39% of the respondents. This was also another indication that Japanese postpartum women were very aware of their breast shape changes and tried to keep to a minimal change by wearing such brassiere. In support of this finding, an American study using online survey of 52,227 heterosexual adults , ages between 18 and 65 showed that most women (70%) were dissatisfied with their breast size or shape (Frederick, Peplau, & Lever, 2008). Moreover, they found that the younger women were more likely to worry about their breast size, whereas the older women were more focused on breast shape (Frederick, et al., 2008). The Japanese postpartum women were more sensitive about not only their weight status but also breast shape than their Australian counterparts. A previous study showed that the women in Asian countries were often more likely to focus on body shape, weigh status, and smaller BMI than those who in Caucasian countries (Forbes, 2008; Swami, Caprario, Tovée, & Furnham, 2006; Wardle, Haase, & Steptoe, 2006). Although these studies mostly investigated body image amongst young and single women, this trend would be able to apply to postpartum women.

5.6 Postpartum women's body image with breastfeeding outcomes

5.6.1 Breastfeeding duration and women's perception of breast shape changes

One of the highlights in the Japanese study was that the Japanese women who perceived changes in their breast shape at 18 months postpartum were significantly more likely to discontinue 'any breastfeeding' to six months postpartum by multivariate analysis (see chapter 4, Table 45). This result was consistent with the findings of other studies that the postpartum women who were concerned about their breast shape changes tended to influence the duration of breastfeeding (Ahn, et al., 2010; McLennan, 2001). Even in women who underwent breast argumentation (n = 97), breastfeeding was not success in terms of its initiation and duration at two or more weeks postpartum (86%) if they had negative perceptions of breast shape due to breastfeeding, compared with those who had positive perceptions ($p < 0.05$) (Cruz, 2011). Despite the most Japanese postpartum women in the present study were categorised their BMI into 'underweight' or 'normal', a strong body image among them by focusing on their body and breast shape could be observed. They experience tension between their opposed beliefs, the positive effect of breastfeeding on weight loss and a negative effect on changes in breast shape. A small retrospective case series by Rinker et al. (2008) suggested that changes of women's breast shape had occurred since their pregnancy and breastfeeding durations were not statistically related. Rather, the higher age, smoking status of mothers, greater bra size, pregnant numbers, more than 50 pounds weight loss in the past and larger BMI are more related to the breast shape changes (Rinker, et al., 2008). However, given the nature of this study and the small sample size further study are needed. A longitudinal study about changes of breast shape found that the changes in Japanese women often started from their 20s, it was before breastfeeding (WACORL, 2010).

Unlike the Japanese study, the results from the Australian study differed from previous studies in regard with the postpartum women's body image (Ahn, et al., 2010; Barnes, et al., 1997; McLennan, 2001). The PIFS II found that the women's perceptions of changes in their breast shape due to breastfeeding were not significantly related to a reduction in the duration of breastfeeding after adjusting on

potential confounders (See chapter 4, Table 66), indicating that there was a strong culture of supporting breastfeeding in Australia. Although the postpartum women might feel changes in their breast shape, this reason itself did not outweigh the benefits for their infants and did not lead them to discontinuing breastfeeding in the present study.

5.6.2 Implications of the study results

These two studies suggested the postpartum women's body image in relation to breastfeeding outcomes vary between cultures. For instance, exposure to media stereotypes that influences opinions of postpartum women's body image was different (Slevec & Tiggemann, 2010; van den Berg et al., 2007). The media papers sensationalise every female celebrity body shape at post birth, which was mostly emphasise on how quickly they regain of their pre-pregnancy shape as they became slim (Roth, Homer, & Fenwick, 2011). These postpartum women's body shape is hyped up in the media as an 'ideal' body shape of postpartum women. The Japanese women may be easily influenced by media and may seek to make the 'ideal' shape portrayed in the newspapers and magazines as their view of reality. Therefore, they may put their priority to focus on their weight and body shape. As a result, their body image perceptions have affected their breastfeeding outcomes. A study of 248 pregnant women in Japan showed that the majority of them (85.9%) desired to return to their pre-pregnancy shape after delivery (Takimoto, Mitsuishi, & Kato, 2011). However, in actuality, many of them have struggled with weight loss to achieve their goals (Walker & Freeland-Graves, 1998). In a qualitative study exploring Australian women's body image through celebrity stories particularly, topic focusing on postpartum body shape, Roth et al. (2011) explained that these media conveyed a message that the postpartum women needed to make extra special efforts to regain pre-pregnancy body shape the same as these celebrities. Most Australian women might consider these celebrity stories as lacking of feasibility. The results of the present study often posed the question as to how the media should deal with healthy postpartum body shape. It is important to recognize that the media have partially contributed the formation of postpartum women's body image as a cultural value and have permeated their infant feeding practices.

In some studies, women's body image has been found to influence infant feeding methods. A Taiwanese study found that women who had a negative body image during pregnancy tended not to breastfeed and it was difficult for them to establish maternal-foetal attachment (Huang, et al., 2004). In an Austrian cohort study, postpartum women who had a low body image and dissatisfaction with their body shape tended to have low self-efficacy, levels and depressive signs, which were related to a shorter duration of breastfeeding (Blyth, et al., 2004). Moreover, women's self-efficacy level during breastfeeding and their perceived 'insufficient breastmilk production', which was a common problem in breastfeeding, were significantly correlated (Otsuka, et al., 2008). Not only constant unsettled behaviours by infants but also poor body images that are smaller breast size and unsatisfied breast shape unable to enough produce breastmilk may drive women to such negative perceptions. Although this present study did not examine relationships among breast size in women, breastmilk volume, insufficient breastmilk production and breastfeeding duration, women's body image particularly, their perceptions towards breast shape may give a clue to explain for perceived 'insufficient breastmilk production'.

In addition, these media stereotypes have influenced the opinions of males, peers, and family about how women's body shape should be. This means that the one's body image is also different from individual perceptions. A study by Swami et al. (2006) compared men's opinions about women's physical attractiveness between Britain and Japan and found that Japanese men preferred a smaller BMI in women and considered BMI to be a more important factor in physical attractiveness for women than their British counterparts (Swami, et al., 2006) Japanese men were more likely to be swayed towards opinions from media and Japanese women thus, are very concerned about what other people including Japanese men think of them. In the questionnaire of the Attention to Body Shape Scale (ABS), the Japanese postpartum women showed their concerns about particularly, 'public eyes'. Many of them agreed to buy and wear cloths to hide worst parts of their body. Part of the challenge for Japanese postpartum women in dealing with their own physical attractiveness including body and breast shape changes may be to identify the behavioural cues in their partners' attitudes. Accordingly, their body image could be a factor to hinder them from the continuation from breastfeeding as they pursue their

'ideal shape'. Freed et al. (1992) explored the beliefs of American expectant fathers regarding infant feeding methods. In their study, the fathers who preferred women to bottle-feed their infants assumed that breastfeeding made women's breasts sag and believed it to be uncomfortable for women (Freed, et al., 1992). However, these presumptions were based on poor knowledge of breastfeeding but this would develop distorted body images amongst women. While further study into the associations among partners' attitudes, breastfeeding outcomes, and postpartum women's body image is necessary, women's partners (fathers of infants) also need to be educated about breastfeeding knowledge and should include negative outcomes to infants resulting from women's distorted body image.

Nevertheless, women's perceptions of changes in their breast shape vary between individuals. A study of 496 postpartum women in Italy found that the rate that women described about changes of their breast shape were similar regardless of experiences in breastfeeding (75% of breastfeeding and 69% of non-breastfeeding women) (Pisacane & Continisio, 2004). Pisacane and Continisio (2004) thus argued that women might be extremely prepossessed with the notion of changes in breast shape, but they stated that fear of change in breast shape was associated with these women's perceptions. Several studies have addressed the issue that postpartum women have faced conflicts between motherhood and womanhood (Hall, 1997; Weichert, 1975) as women's breasts are a symbol of adult sexuality and femininity in many cultures (Miller, 2003). In an early study, Weichert (1975) described women's feelings as follows:

> 'One of the major anxieties women have in relation to breastfeeding is that they fear lactation will change the shape of their breasts, and hence it is threatening to their notion of continued attractiveness' (p.988).

However, McLennan (2001) argued that postpartum women usually would not be acceptable for them to express personal reasons for discontinuation of breastfeeding, including fear of changes in their body shape. Even though they may have personally negative feelings related to the changes in their body and breast shape, they may repress these feelings at a personal level and only acknowledge that they operate at a community level. In her study, for example, 69 of 206 women (33.5%) stated that they thought there was community apprehension about their body or

breast shape changes due to breastfeeding, but none of them accepted that it applied to them personally (McLennan, 2001). Postpartum women's body image on breastfeeding issues rarely appear in surveys as mothers tend to report only socially 'desirable', 'acceptable' or more 'child-focused' factors as reasons for ceasing breastfeeding (McLennan, 2001). Many postpartum women noticed ongoing changes in shape, size, and appearance during breastfeeding, but considered that breastfeeding was in their infants' best interests. The Australian study showed that women's beliefs about the importance of breastfeeding for the benefit of their infants overrode their concerns about the effect of breastfeeding on their body image including their breast shape, compared with the Japanese counterparts. Hector et al. (2005) concluded that it could be very difficult to understand personal psychological factors including perceived changes of body image related to breastfeeding outcomes. In fact, some participants in the Japanese study refused to answer the items of the BSQ-8c. The Japanese women might be culturally ashamed to express their body or breast in publicity. In order to more understand postpartum women's body image, full items of the BSQ-8c need to be apply for further study.

In the present two studies, women's perceptions of changes in their breast shape were not statistically related to their age. However, younger women are often more like to worry about breast shape changes. A study of 275 American undergraduate female students found that they were more concerned about three aspects of breastfeeding; embarrassment, body shape, and impact on sexuality (Johnston-Robledo, et al., 2007). Whereas only 29% of the women planned to choose exclusive breastfeeding, over half of the sample (51%) had decided before pregnancy not to undertake any breastfeeding (Johnston-Robledo, et al., 2007). Similarly, the same authors explored the correlation between breastfeeding practice and awareness of their body and breast shape of pregnant women with low income status (Johnston-Robledo & Fred, 2008). Pregnant women with a high awareness of their body and breast shape were more anxious about the negative effects of breastfeeding compared to pregnant women with a low awareness of their body and breast shape (Johnston-Robledo & Fred, 2008). A Japanese study by Takimoto et al. (2011) of 248 pregnant women showed that more than 35% of them currently were on diet by self-judgement and the women with younger age were more likely to restrict their weight gain during pregnancy by dieting (adjusted OR = 7.16, 95% CI = 1.79-28.6). These

studies indicated that women, particularly young women, who are very conscious about their body and breast shape, may choose not to breastfeed or alternatively initiate breastfeeding, but more readily introduce bottle feeding at an earlier stage.

In the present two studies, postpartum women also had misunderstandings about breastfeeding concerning their body image such as 'breastfeeding caused breast shape change'. Cruz (2011) stated that women's perceptions of breastfeeding effects towards breast shape is a key for successful outcomes in breastfeeding. Promoting the continuation of breastfeeding by women with strong perceptions about their body and breast shape is thus an important area to consider for future promotion programs with specific groups in order to increase breastfeeding rates. Moreover, postpartum women's body image may vary at different time since delivery. A 12 months cohort study in Australia, which examined the relationship between pre and postnatal depression and women's body dissatisfaction, found that their perceptions on body shape changes tended to be maximized at six weeks and six months of postpartum periods rather than during their pregnancy (Clark, et al., 2009). While Japanese postpartum women's body image during breastfeeding needs to be monitored, they might have increased concerns and perceptions in changing their breast and body figure in weaning periods than immediate postpartum periods. Further studies are needed to document the cultural differences with a wider population sample and different time points in the postpartum periods.

5.7 Relevant issues that affect postpartum women's body image in Japan

Several issues, which have potentially affected the relationship between postpartum women's body image and breastfeeding outcomes, may contribute to the results of the Japanese study.

Firstly, strict weight control throughout pregnancy is a possible reason for Japanese postpartum women to remind them of keeping a strong aspiration for slimming down after childbirth. Several studies have shown that Japanese women averagely increase their body weight during pregnancy ranging from 9.8kg (n = 550) (Takahashi &

Yoshitda, 1998) to 10.5kg (n = 1,126) (Ueda, Maruo, & Niiya, 2001). Gestational weight gain in Japan is lower than in other countries. Weight gain during pregnancy by Australian women was 14.8kg (n = 7,233) (Mamun et al., 2009) and by 16.8kg (n = 615) in women with 'normal' category of their pre-pregnant BMI in Iceland (Thorsdottir, Torfadottir, Birgisdottir, & Geirsson, 2002). Compared with the guideline from the Institute of Medicine (IOM) for Asian women, this Japanese average of gestational weight gain was very small but was within acceptable range in the several Japanese guidelines (see Table 71).

Historically, the one of the highest cause in maternal deaths in the 1950s in Japan was the pregnancy-induced hypertension, which was often related to the excessive weight gain during pregnancy (Science Council of Japan, 2008). Moreover, excessive weight gain during pregnancy tended to be a danger of a complicated birth (Thorsdottir, et al., 2002). According to a study by Takimoto et al. (2011), more than 69% of Japanese pregnant women (n = 248) believed that an infant with lighter birth weight made their delivery easier and thus those who desired to have a smaller infant were more likely to go on a restricted diet during their pregnancy. While the strict gestational weight control has been carried out to prevent harmful effects on the maternal and child health in Japan, there is still limited evidence to convince Japanese women to strictly control their weight during pregnancy. There are several current guidelines of gestational weight gain for Japanese women which vary in the amount of recommended weight gain (see Table 71).

Table71: Several guidelines of the recommendable weight gain during pregnancy

Association of the guideline	Country	Year	Pre-pregnancy BMI (kg/m^2)	Total weight gain (kg)
Japan Society of Obstetrics and Gynaecology	Japan	1997	< 18	10-12
			18-24	7-10
			> 24	5-7
Ministry of Health and Welfare	Japan	2006	< 18.5	9-12
			18.5-25	7-12
			> 25	Individual counseling
Japan Society For The Study of Obesity *	Japan	2006, 2007	Less than 120% of standard body weight (mildly-obese pregnant women)	Less than 5
			More than 120% of	Less than 7

			standard body weight (heavily-obese pregnant women)	
Institute of Medicine	US	2009	<18.5	12.5-18.0
			18.5-25	11.5-16.0
			25-29.9	7.0-11.5
			≥30	5.0-9.0
Modification of the Institute of Medicine, for Asian Women	Singapore	2010	<18.5	12.0-18.0
			18.5-22.9	11.5-16.0
			23-27.5	7.0-11.5
			≥27.5	≦7.0

*For overweight and obese pregnant women only

These inconsistent guidelines lead to confusion. Women's body image in Japan could be distorted by controlling weight gain to a minimal increase during their pregnancy. Insufficient gestational weight gain is significantly associated with small of gestational age in infants and Low Birth Weight infants (LBW) (Ohmi, Hirooka, Hata, & Mochizuki, 2001; Watanabe et al., 2010). LBW infants have the potential to have higher rates of chronic diseases in adulthood (Barker, 1997). Nevertheless, the national rates of LBW at nearly 10% and pre-term birth at nearly 6% in 2010 have been increasing in Japan (Boshi Hoken Jigyoudan, 2011). In the present Japanese study, the LBW rate was 8.4%. There is a need for education of health professionals about the developmental origins of adult diseases hypothesis where by insufficient weight gain during pregnancy results in LBW infants and then increased chronic diseases later in life. Women who are 'underweight' are also more likely to be at increased the risk of osteoporosis in their later life (Blum et al., 2001). Therefore, it is recommended to develop a consistent guideline for Japanese women with emphasizes on long terms benefits of women's and infants' health. In order to assist Japanese women to establish their appropriate body image during pregnancy and to reduce risk factors for early breastfeeding cessation, further studies including prospective cohort and an intervention study are required.

Secondly, the prevalence of 'underweight' category in BMI among the young women has increased in Japan (Takimoto, Yoshiike, Kaneda, & Yoshita, 2004), which in turn results in lower pre-pregnancy BMI in women. The proportion of women with 'underweight' of their BMI category in their 20s and 30s has increased from 12.4% and 7.8% in 1980 to 22.3% 14.4% in 2009, respectively (Ministry of

Health Labour and Walfare, 2002; Ministry of Health Labour and Welfare, 2010b). Nevertheless, the government report cited that the more than half of the women with these age groups overestimated their weight and thought they were obese and thus attempted to reduced their weight in appropriately (Ministry of Health Labour and Welfare, 2009a). Hayashi et al. (2006) also agreed that many Japanese women regardless of their age always attempted to lose their weight, even though they were within the 'normal' range of their BMI. Several studies found that women with low BMI before pregnancy had significantly more LBW infants (Ronnenberg et al., 2003) and preterm births (Salihu, Mbah, Alio, Clayton, & Lynch, 2009). Combinations of the women's desire to be slim, media stereotypes of 'ideal' women's shape, and inappropriate weight gain during pregnancy have encouraged them to only focus on their postpartum body image with little attention to breastfeeding benefits. Infant feeding practices related to women's body image need to approach towards the younger generations regardless of gender. For the majority of women, their body image during pregnancy and postpartum are based on the ones which are formed in their pre-pregnancy (Chang, Chao, & Kenney, 2006). Breastfeeding education to younger people is essential to enable them to understand the importance to establish appropriate body image, knowledge, and attitudes towards infant feeding practices.

5.8 Reliabilities of the ABS and BSQ-8c

In the Japanese study, two measures, the Attention to Body Shape Scale (ABS) and the Body Shape Questionnaire with short version (BSQ-8c) were used to assess the postpartum women's body image. The ABS score was not a significant factor that was associated with 'any breastfeeding' up to six months of life and the BSQ-8c score was not included into the model of binary logistic regression due to the use of limited items. However, the results were discussed to explore the further postpartum women's body image. As these measures are based on self-reports, over or under estimation of body weight and body image is subjective. Several studies found that Japanese women often over estimate their weight (Sugawara, et al., 2010).

The Cronbach alpha level for the ABS in the present study was 0.53 (See chapter 4, Table 40), which was a reasonable internal consistency, but was lower than the

original study of 49 women being undergraduate students reported by Beebe (1995) ranging from 0.70 to 0.78 and a study by Kagawa et al. (2007) using 139 single, non-lactating Japanese women at 0.70. The total score of the ABS in this present study was 22.5 (SD = 3.6), which was also lower than the Beebe's study ranging from 23.94 (SD = 4.4) to 24.1 (SD = 4.1) (Beebe, 1995) and the Kagawa's study by 24.9 (SD = 3.5) (Kagawa, et al., 2007). The higher the score, the higher the level of consciousness about body shape. While the sample size of Kagawa's study was different form this present study in Japan, which was larger, there is an indication that the Japanese women's body image, particularly consciousness of body shape, might be less in postpartum women than in pre-pregnant counterparts. Nevertheless, the findings from this present study suggested that the Japanese version of the ABS was a sufficiently reliable measure to assess consciousness about body shape for Japanese postpartum women and the applicability of the ABS could be expanded to the target age group of this present study.

The BSQ-8c was first applied to Japanese postpartum women in this present study. There were only five out of eight items used in the study due to the ethical issues raised by Himeji city, and this study gave the alpha level with 0.82 (See chapter 4, Table 41). While this was sufficiently reliable level, it would be still necessary to undertake replicate studies with the usage of full items of the BSQ-8c in order to reconfirm the findings from the present study with more accurate understanding about postpartum women's body image. In addition, the Japanese version of not only the ABS but also the BSQ-8c should be examined for validity.

5.9 Summary

In short, the postpartum women who experienced breastfeeding in Japan were more conscious about their body including the weight status and the breast shape changes than their Australian counterparts. The results of the studies confirm that associations between breastfeeding outcomes and postpartum women's body image are different between cultures. Pregnancy and lactation are times when many changes occur in body shape, particularly changes in breast shape due to the changes in hormonal levels. Some postpartum women believe 'myths' based on poor

knowledge of breastfeeding and body image including 'breastfeeding makes their breast sag'. Further study is needed to reinforce knowledge on this topic. However, the findings of the present studies give an important indication about postpartum women's body image concerning infant feeding practices.

5.10 Limitations of the study

When drawing the conclusions from the results of these Australian and Japanese studies, several limitations need to be considered.

Although this is the first and detailed breastfeeding study that covered a large sample of respondents in Japan (n = 1,612), all of the women were at 18 months postpartum. As a result, there may have been some recall bias. However, Donath and Amir (Donath & Amir, 2002) stated that the recall of postpartum women about breastfeeding information, particularly, the duration of breastfeeding was considered to be more accurate than their recall about the time when they introduced formula, other fluids, or foods. Although the Japanese study is based on self-reported data, the duration of 'any breastfeeding' could be considered as being more reliable data. Another major limitation was the cross-sectional study design. However, a cross-sectional approach would be a better method to understand a tendency of infant feeding practices at the beginning stage particularly, when the pertinent literature on this topic was sparse. Further studies with different methods including a cohort study with a large sample size, would be necessary to verify the results of this study and to accurately identify current problems on breastfeeding in the other areas of Japan. Moreover, this will enable to develop further interventions that are relevant breastfeeding culture in Japan.

By contrast, the respondents in the Australian study were postpartum women who were recruited from only public hospitals and this is a limitation to be acknowledged because this probably reflected a slight bias towards lower socio-economic groups. Women's body image is often related to the women with higher socio-economic groups. Moreover, more data are required before any definite conclusion on the relationship can be drawn. The loss to follow up in the 12 month follow up periods was also an issue of study limitation when interpreting the results.

In both studies, the maternal BMI, the changes of weight in size, and the changes of breast in shape were not assessed by any objective measure and were based on the perceptions of the respondents. As the limited time and resources were available, it is recommended that a longitudinal study with long term should incorporate objective assessment of body image in women. Nevertheless, the findings from this study bring new insights and described an understanding on breastfeeding outcomes in relation to postpartum women's body image under investigations in Japan and Australia.

Chapter 6: Conclusions and recommendations

This chapter provides a summary of key findings from the results of the studies. Directions for future study and some recommendations for health promotion programs are also suggested.

6.1 Summary of the results

In this section, summaries of the results was directly related to the study objectives, which were presented in chapter one.

6.1.1 Infant feeding practices

6.1.1.1 Infant feeding methods and duration of breastfeeding

A major finding of the Japanese study was that the infants were less likely to be exclusively breastfed than their Australian counterparts. In Japan, 87.8% of the postpartum women had been introduced to infant formula by one month postpartum. Compared with the Australian study, the PIFS II, this proportion at four weeks postpartum was less than 40%. Supplemental/prelacteal feeding was also frequently given to the Japanese infants as their first feed while in hospital. Health professionals in the hospitals commonly introduced infant formula or glucose water to infants in 29.8% and 19.5% of cases, respectively. These results reflect the lower initiation rate of breastfeeding and higher prevalence of 'any breastfeeding' in Japan. In the Australian study, however, 84.2% of infants were given breastmilk as their first feed after birth. At one month postpartum, approximately 33% of Australian infants were exclusively fed by breastmilk at the four weeks postpartum.

Almost 50% of the Japanese women decided on their infant feeding method either before or during pregnancy, while nearly 92% of the Australian women did so in the same time frame. Approximately 40% of the Japanese women reported that they had made the decision on their infants feeding method after their infants had been born. The mean duration of 'any breastfeeding' was longer in Japan at 9.1 months compared to Australia at 5.8 months. However, interpreting these results, it should be remembered that the methodology used in the Japanese study was a cross-

sectional survey and in the future it would be useful to undertake a cohort study to test the comparability of the results.

6.1.1.2 Families' involvement in breastfeeding and breastfeeding problems

In Australia, 53.5% of the women's husbands were ardent supporters of breastfeeding, compared to 18.9% of the Japanese husbands. 64.8% of the Japanese husbands had ambiguous opinions towards their preferences of breastfeeding and 14% had had no discussion with their wife about infant feeding methods. This was another important differences in infant feeding practices between the two studies as women who breastfed their infants for a longer periods were often supported by their partners/husbands who clearly preferred breastfeeding. The results of this thesis also suggested that the Japanese postpartum women have to deal with breastfeeding difficulties without sufficient support from close relatives. There was no difference about the preference of infant feeding methods by the own mothers of the women in the studies. In both Japan and Australia, the women's own mothers preferred breastfeeding as the best way of feeding infants.

The most common problem and reason for terminating breastfeeding among the women in Japan and Australia was 'insufficient breastmilk production' based on the women's own perceptions. 'Cracked or sore nipples' was the common problem at 10 weeks postpartum in Australia and was the second common problem in Japan. Most of the postpartum women in Japan and Australia expressed breastmilk for their infants at some time. In Japan 69.3% and in Australia 72.7% expressed their breastmilk on one occasion or more. However, there were fewer users of electric breast pumps in Japan at about 11% compared to Australia at about 20%.

6.1.1.3 The prevalence of smoking and alcohol consumption during breastfeeding

Smoking increased the risk of ceasing breastfeeding in Australia and Japan. The smoking rate reported by the Japanese women during breastfeeding was 10.6% and a further 1.3% had quit smoking during breastfeeding. Their average consumption level of cigarettes per day was between half pack to one pack (20 cigarettes). Smoking status of these women was negatively associated with the duration of 'any breastfeeding' to six months postpartum (adjusted OR = 0.32, 95% CI = 0.15-0.66). A similar trend was observed in the Australian study. The prevalence of smoking

reported by the Australian women lay between 23% and 39% during the follow-up periods. They smoked on average less than 20 cigarettes daily. The Australian study also confirmed that smoking women were less likely to continue breastfeeding throughout all periods of follow-up. This risk became the highest at 10 weeks postpartum, compared with non-smoking women (RR = 1.90, 95% CI = 1.52-2.38).

Alcohol consumption during breastfeeding often negatively influences breastfeeding outcomes. However, the results were not same in the two studies. In the Japanese study, the proportion of women who consumed alcohol during breastfeeding was 14.1% and most of them set no regular time for drinking. The Japanese study found that alcohol consumption during breastfeeding were more likely to continue 'any breastfeeding' to six months postpartum when non-drinking women were the reference group (adjusted OR = 2.00, 95% CI = 1.18-3.39). In the Australian study, the mean proportion who consumed at least one drink of alcohol during breastfeeding was 45.4% throughout the study period. Most of them took alcohol before/after/with meals. However, this factor did not significantly influence the duration of breastfeeding in most of the study periods.

6.1.1.4 Iowa Infant Feeding Attitudes Scale (IIFAS)

The Iowa Infant Feeding Attitudes Scales (IIFAS) were significantly correlated with the duration of 'any breastfeeding' to six months postpartum in Japan after adjusting potential confounders but excluding variables related to the postpartum women's body image (adjusted OR = 1.05, 95% CI = 1.02-1.08). The IIFAS in the Australian study was also correlated to 'full breastfeeding' to six months postpartum and 'any breastfeeding' to 12 months postpartum. However, there could be seen a trend that the postpartum women with a higher score of the IIFAS tended to continue breastfeeding than those who with a lower score in both studies. The IIFAS would be useful to screen women particularly, those who are at high risk of ceasing breastfeeding. The IIFAS score in Japan was the lowest by 54.2 (SD = 4.9) amongst other studies including Australia by 64.4 (SD = 8.3). While more than half of the Australian women accepted 'the convenience of breastfeeding', less than 10% of the Japanese women did so. The item of 'infant formula is as healthy as breastfeeding' was supported by more than half of the Japanese women but by less than 20% of their Australian counterparts. The different rates of alcohol consumption during

breastfeeding were also reflected by the IIFAS that was the Australian women were more optimistic about alcohol intake during breastfeeding than their Japanese counterparts.

6.1.1.5 Factors associated with breastfeeding duration

In the Japanese study, factors positively associated with the duration of 'any breastfeeding' were being a primipara (adjusted OR = 2.26, 95% CI = 1.05-4.87), women decided on infant feeding methods before pregnancy (adjusted OR = 2.73, 95% CI = 1.79-4.18), the late introduction of infant formula (adjusted OR = 1.07, 95% CI = 1.03-1.11), and alcohol consumption during breastfeeding (see above section 6.1.1.3). On the other hand, working women in non-professional areas (adjusted OR = 0.41, 95% CI = 0.23-0.72), breastfeeding problems (adjusted OR = 0.34, 95% CI = 0.23-0.51), smoking during breastfeeding (see above section 6.1.1.3), and perceived change sin breast shape (adjusted OR = 0.60, 95% CI = 0.40-0.91) had negative effects on the duration of 'any breastfeeding'. Some factors were also observed in the Australian study that was published elsewhere (Scott, et al., 2006). In the Japanese studies, some factors including IIFAS score, family annual income between 6,500,001 and 8,500,000 (yen) did become insignificant in relation to 'any breastfeeding' duration after adjusting the factors related to women's body image.

6.1.2 Postpartum women's body image

6.1.2.1 Body Mass Index (BMI) and descriptions of changes in weight and breast shape

There were 23.9% of the Japanese women whose BMI before the first pregnancy lay in the 'underweight' category, while this rate declined to 17.8% at 18 months postpartum. In contrast, the rate of 'underweight' as assessed by their BMI before the first pregnancy was lower amongst the Australian women by 7.7%. Both women, Japan and Australia believed that breastfeeding helped to reduce their weight but the Japanese women had greater expectations than the Australian women. Although women's BMI was not related to the duration of 'any breastfeeding' in these two studies, many women perceived that changes occurred in their weight and breast shape. The most common reported change in breast shapes due to breastfeeding among Japanese women at 18 months postpartum was 'loss in firmness' 76.2%, followed by 'became smaller in sizes' 61.7%, and 'sagging' 60.2%. In contrast, the

Australian women at 12 months postpartum described ‘sagging’ as their most common change by 28.4% and ‘became smaller in sizes’ by 20.6%. Japanese women were very conscious their breast shape than their Australian counterparts.

6.1.2.2 Breastfeeding duration and women’s perceptions of breast shape changes

The women’s perceptions of changes in their breast shape were significantly associated with ‘any breastfeeding’ to six months postpartum in the Japanese study (see above section 6.1.1.5), but this relationship did not occur in the Australian study. However, a tendency was observed among the Australian women that those who with a longer duration of breastfeeding were more likely to perceive changes in their breast shape at 52 weeks postpartum.

6.2 Recommendations

Based on the results of the two studies reported here, it is possible to take a number of suggestions for health promotion activities and for future research to increase the understanding of the issues investigated in these studies.

- Further studies are needed to confirm the findings of this study in other areas of Japan. Particularly, studies on infant feeding practices are best undertaken using a prospective cohort design and with clear definitions of breastfeeding type. The sample size will depend on the region to be studied, for example a national or regional estimate of the prevalence of breastfeeding. These studies will also allow monitoring changes in the factors influencing infant feeding practices. In turn, reliable information on breastfeeding can develop more relevant interventions hereafter.
- The measures used in this study such as the IIFAS, ABS, and BSQ-8c were selected for use so that international comparisons could be made. However, their reliability and validity for use in Japan may be improved in future research by removing or replacing items after further research and factor analysis. More attention needs to be given to specific cultural issues in Japan in future studies.

- Further qualitative studies could be undertaken to explore the postpartum women's body image in reproductive periods including their experiences of changing not only their weight or breast shape but also other components of of body image at different phases of pregnancy and lactation and in relation to phases of infant feeding. This will add to the information gained to date and will increase understanding women's body image with breastfeeding and allow improved health promotion programs.
- Several factors including the use of supplemental/prelacteal feeds, the early introduction of infant formula, family's preferences in infant feeding methods, alcohol consumption during breastfeeding, and smoking status (woman and their husband/partner) need to be further examined and be incorporated within the education programs in order to increase 'exclusive breastfeeding' duration in rates in Japan. Recommendations should be introduced for health professionals to restrict supplementary/prelacteal feeds unless warranted for medical reasons. Advertising of infant formula and distributing of samples should be controlled.
- Appropriate infant feeding methods particularly, this by breastfeeding education presenting accurate knowledge of breastfeeding and short/long-term benefits of breastfeeding should be focused to not only mothers but also fathers, family, and (a) health professional (s). The effect will be strengthened by efforts to change attitudes of health professionals and the general community.
- The content of breastfeeding education needs to be coherent and expanded and consider given to when it should best be provided. The content also includes what a healthy postpartum women's body shape is when implementing health promotion programs in order to strengthen the health status of the children in Japan.
- Considerations of postpartum women's working environments as baby-friendly, for instance, flexible work hours, breastfeeding breaks, loan system of electrical pumps for breastmilk, and ongoing social and practical support systems for mothers dealing with breastfeeding difficulties particularly, in addressing perceived insufficient breastmilk production and infants refusal to

breastfeed should be further taken to enable women to continue breastfeeding in Japan and Australia.

- In order to develop clear guidelines about the impacts of alcohol consumption and smoking, these factors should be further examined to describe in relation to infant feeding practices in Japan as they are associated with 'any breastfeeding' rate. However, smoking including passive smoking always needs to be strictly controlled and be prompted by advertising and other anti-smoking health promotion.
- Details on gestational weight gain and changes in body/breast shape using objective measures need to be undertaken for further studies to more accurately observe the changes. These must be investigated in relation to women's eating habits, calorie intake during pre and postpartum periods, and physical exercise levels that may affect breastfeeding outcomes including breastmilk production. However, the media should be encouraged (educated) not to portray 'thin' shaped women as an 'ideal' body shape. A healthy body image for Japanese women needs to be developed.
- Health promotion campaigns are warranted to help Japanese women adjust or cope with bodily changes during postpartum period, as the difference is vast between the Japanese and Australian women in terms of their perception of formula feeding and breastfeeding. Further research is needed to monitor any shifts occurring in postpartum women's body image associating infant feeding practices in the Australian and Japanese environments. It would be interesting to replicate this study after 10 or 20 years as these women pass through life phases and aging that may influence to next generation.
- Finally, relevant interventions that consider cultural factors including health, body, and nutrition programs on promoting 'exclusive breastfeeding' targeting towards not only women but also their family members, health professionals, and society should be developed to improve their knowledge of the importance of 'exclusive breastfeeding' in the first six months of life.

6.3 Conclusion

In conclusion, this present study provided comprehensive information in breastfeeding and an insight in regard to breastfeeding duration associating the postpartum women's body image, particularly, perceptions of breast shape changes in Japanese and Australian women. These results were derived from a self-reported questionnaire or telephone interviews participated by the postpartum women within the limitations of the study. The results showed that poor understanding of breastfeeding may lead poor body images in postpartum women and vice versa. The overall goal of every country including these two countries is to improve 'exclusive breastfeeding' in rates and lengths. This goal could be achieve by acknowledging cultural factors, ethnicity, and social expectations of 'ideal' women's body and breast shape in adding the common factors in breastfeeding while providing promotion campaigns in forms of education. Although women's body image varies a lots between individuals, environments, cultures, and generations, the best breastfeeding practices are unchangeable that even go beyond these.

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Appendices

Appendix A: The letter of ethics approval

memorandum

To	Professor Colin Binns School of Public Health
From	Dr Stephan Millett, Executive Officer, Human Research Ethics Committee
Subject	Protocol Approval **HR 63/2006**
Date	10 August 2006
Copy	Madoka Inoue, School of Public Health Graduate Studies Officer, Division of Health Sciences

Curtin University of Technology
Office of Research and Development

Human Research Ethics Committee

TELEPHONE 9266 2784
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Thank you for your application submitted to the Human Research Ethics Committee (HREC) for the project titled "*Breastfeeding and perceptions of breast shape change in Australian and Japanese Women*". Your application has been reviewed by the HREC and is **approved**.

- You are authorised to commence your research as stated in your proposal.
- The approval number for your project is **HR 63/2006**. *Please quote this number in any future correspondence.*
- Approval of this project is for a period of twelve months **08-08-2006** to **08-08-2007**. To renew this approval a completed Form B (attached) must be submitted before the expiry date **08-08-2007**.
- If you are a Higher Degree by Research student, data collection must not begin before your Application for Candidacy is approved by your Divisional Graduate Studies Committee.

Applicants should note the following:

- It is the policy of the HREC to conduct random audits on a percentage of approved projects. These audits may be conducted at any time after the project starts. In cases where the HREC considers that there may be a risk of adverse events, or where participants may be especially vulnerable, the HREC may request the chief investigator to provide an outcomes report, including information on follow-up of participants.

The attached **FORM B** should to be completed and returned to the Secretary, HREC, C/- Office of Research & Development:

- When the project has finished, or
- If at any time during the twelve months changes/amendments occur, or
- If a serious or unexpected adverse event occurs, or
- 14 days prior to the expiry date if renewal is required.

An application for renewal may be made with a Form B three years running, after which a new application form (Form A), providing comprehensive details, must be submitted.

Regards,

Dr Stephan Millett
Executive Officer
Human Research Ethics Committee

Please Note: The following standard statement must be included in the information sheet to participants:
This study has been approved by the Curtin University Human Research Ethics Committee. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.

Appendix B: Information sheet

The School of Public Health at Curtin University is studying how babies are fed and how this feeding pattern has influenced mothers' perceptions of their body/breast shape change as a result of breastfeeding. This study is also looking at how breastfeeding duration affects the infant's growth. The findings of this study will provide women with useful and reliable information in terms of breastfeeding issues, and also important for health professionals to support women during the postpartum period. In turn, it will enhance mothers' breastfeeding practice. As part of this project mothers are being asked about their experiences and opinions. Initially, as a mother, you will be asked to complete a questionnaire. If you are happily able to help us with our research, please return the questionnaire on the day of the health check for your baby.

The contents of the envelope that you have been provided include:

- Information sheet (this sheet)
- A questionnaire

All information from the questionnaire is to be treated as confidential and your name will not appear in any research reports and publications. The information gained from this study will be stored in a locked cupboard for five years following the completion of this study and then they will be destroyed. The ethics committee of Curtin University of Technology has approved this study. If you have any questions or require any further information concerning this study, please do not hesitate to contact us below.

Thank you in anticipation of your assistance.

Yours sincerely

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Dear Mothers

Although this survey is not directly related to the medical health check-up for your infant at 18 months of age, the main purpose of this survey is to know your knowledge and attitudes of breastfeeding and child development. The results of this study will be beneficial for not only you but also Himeji city in term of addressing a new policy of childcare support in the future. Therefore, we as Himeji city have supported this survey. Please understand the purpose of the study and help to complete the questionnaire.

Thank you for your attention.

Executive Head of Central Public Health Centre

Himeji city

Curtin University of Technology

Appendix C: Study questionnaire (The Japanese infant feeding study in Himeji)

Thank you for participating in this research.

This survey has asked about your opinions and perceptions towards breastfeeding and breast shape. There are no correct answers. It will only take 30-40 minutes. All of your responses will be strictly confidential, so please be honest and answer every question and return by mail using the replay-paid envelope provided.

Section 1: Breastfeeding experience

Office use only

- In this section we are interested in finding out about how you were feeding your last baby. If you breastfed more than one baby, base your answers on the most recent experience

ID code:

1 When did you **first** decide how you were going to feed your last baby?

Before I became pregnant _____1
Early in my pregnancy _____2
Late in my pregnancy _____3 (q1)
During labour _____4
After my baby was born _____5

2 How did you feed your last baby?

Bottle-feeding infant formula---**GO TO Q3** _____1
Breastfeeding only ----------**GO TO Q4** _____2
Mainly bottle-feeding (formula) but also breast-feeding------**GO TO Q3** _____3 (q2)
Mainly breastfeeding but 'topping up' with bottle-feeding (formula) **GO TO Q4** ___4
Other (please specify) _____

If you decided to bottle-feed your baby from the start

3 What were the reasons for this choice?
(Please circle **any answers** that apply. You can have **more than one answer**)

Formula is better for the baby _____1 (q3.1)
Bottle-feeding is easier _____2 (q3.2)
I don't like breastfeeding _____3 (q3.3)
I will go back to work soon after the birth _____4 (q3.4)
Breastfeeding will make my breasts sag _____5 (q3.5)
The baby's father prefers bottle-feeding _____6 (q3.6)
Formula is just as good as breast milk _____7 (q3.7)
The baby's father can help with bottle-feeding _____8 (q3.8)
I want to know how much milk my baby has at each feed _____9 (q3.9)
I want to continue smoking _____10 (q3.10)

I play a lot of sport	11	(q3.11)
Breastfeeding is too embarrassing	12	(q3.12)
My mother suggested bottle-feeding	13	(q3.13)
Friend or relative suggested bottle-feeding	14	(q3.14)
Health worker (e.g. doctor, nurse) suggested bottle-feeding	15	(q3.15)
Other (please specify) _____		(q3.16.1)

If you decided to breastfeed from the beginning

4. Why did you decide to breastfeed?
(Please circle **any answers** that apply. You can have **more than one answer**)

Breast milk is better for the baby	1	(q4.1)
Breastfeeding is the right thing to do	2	(q4.2)
Breastfeeding is cheaper	3	(q4.3)
Breastfed baby is more intelligent	4	(q4.4)
Breast-feeding will make my breasts sag	5	(q4.5)
Breastfeeding helps you lose weight	6	(q4.6)
Breastfeeding is fashionable	7	(q4.7)
Breastfeeding helps to prevent allergies	8	(q4.8)
Breastfeeding is more convenient	9	(q4.9)
Other (please specify) _____		

5a Did you had any difficulties with breastfeeding?

Yes-------- **GO TO Q5b**	1	(q5a)
No ---------**GO TO Q6**	2	

5b What difficulties experienced?
(Please circle **any answers** that apply. You can have **more than one answer**)

Cracked or sore nipples	1	(q5b.1)
Breasts engorged (too full)	2	(q5b.2)
Mastitis or breast infection	3	(q5b.3)
Inverted nipples	4	(q5b.4)
Breastfeeding is painful	5	(q5b.5)
Baby not gaining enough weight	6	(q5b.6)
Baby has difficulties sucking	7	(q5b.7)
Baby gets too much milk or too fast	8	(q5b.8)
Poor 'let-down'	9	(q5b.9)
Baby refuses to breast-feed	10	(q5b.10)
Baby too tired to feed i.e. falls asleep at breast	11	(q5b.11)
Feeling that I'm not doing very well at breastfeeding	12	(q5b.12)
Not enough milk for baby	13	(q5b.13)

Other (please specify) _____ (q5b.14.1)

6 How many months did you breastfeed your last baby? _____months (q6)

7 What weeks of in did you first give infant formula to your last baby? _____week(s) (q7)

8 Did your mother breastfeed any of her children?

Yes 1 (q8)
No..... 2
Don't know..... 3

9 Did the baby's father have any preference for how you feed your baby?

Yes, he prefers bottle-feeding..... 1 (q9)
Yes, he prefers breastfeeding..... 2
He doesn't mind how I feed my baby 3
Never really discussed the matter with him..... 4

10 Did your mother have any preference for how you feed your baby?

Yes, he prefers bottle-feeding..... 1 (q10)
Yes, she prefers breastfeeding 2
She doesn't mind how I feed my baby 3
Never really discussed the matter with her 4

11a Have you expressed your milk?

Yes-------- **GO TO Q11b**..... 1 (q11a)
No --------- **GO TO Q12**..... 2

11b What method did you **mainly** use to express your milk?

By hand express (not using pump) 1 (q11b.1)
Manual pump 2
Electric pump 3
Please specify 4 (q11b.2)

_____

11c Did you have any difficulties expressing your milk?

Yes-------- **GO TO Q11d**..... 1 (q11c)
No --------- **GO TO Q12**..... 2

11d What difficulties? - expressing milk:

Took too long 1 (q11d.1)
Was painful 2 (q11d.2)
Couldn't get very much/enough milk 3 (q11d.3)
Other difficulties experienced (expressing milk)..... 4 (q11d.4)

Please specify _____

12 What months did you **actually** give solids to your last baby?

Please answer the baby's age in month. ..... Months (q12)

13 How did your friends feed their babies?

Most chose to bottle-feed 1 (q13)
Most chose to breast-feed 2
Some chose to breast-feed and some to bottle-feed 3
Don't know how they fed their babies 4

14 How was your most recent child delivered?

Vaginal without forceps or suction 1 (q14)
Vaginal with forceps or suction 2
Caesarean 3

15a Did you drink alcoholic drinks during breastfeeding?

Yes-------- **GO TO Q15b** 1 (q15.a)
No --------- **GO TO Q16a** 2

15b When during the day did you used to have a drink in those days?

Just before feeding the baby 1 (q15.b)
Just after feeding the baby 2
In-between feeds 3
At no particular time 4
Just before or with the evening meal 5

16a Would you breastfeed another child if you had another baby?

Yes----------**GO TO Q16b** 1 (q16.a)
No----------**GO TO Q16c** 2
Yes, if I could ----**GO TO Q16b** 3

16b Why would you breastfeed another baby?

Better for baby 1 (q16.b)
Better for mother 2
More contented baby 3
Natural 4
Closer relationship with baby 5
Enjoyment/satisfaction of mother 6
No particular reason 7
Please specify 8

16c Why wouldn't you breastfeed another baby?

(q16.c)

Inconvenient	1
Lack of enjoyment/satisfaction of mother	2
Tied to the house	3
Embarrassment	4
Too emotionally taxing for mother	5
Formula is just as good	6
Baby's father feels left out	7
Other responses - why wouldn't breastfeed another child	8

Please specify _____

17 What was your last baby's first feed in hospital?

(q17)

Formula	1
Breast milk (or colostrum)	2
Cow's milk	3
Glucose water	4
Plain water	5

Other (please specify) _____

18 Please tell me what was your **final reason** for stopping breastfeeding to your most recent child?

(Please circle **any answers** that apply. You can have **more than one answer**.)

(q18)

Baby old enough to not be breast-fed	1
Baby weaned itself	2
I've done my bit, given a good start	3
Breastfeeding too painful	4
Cracked or bleeding nipples	5
Breast engorgement	6
Breast infection/mastitis	7
Inverted nipples	8
Problem with nursing technique	9
I was anxious or unsure about breastfeeding	10
Breastfeeding requires too much motivation	11
Breastfeeding too difficult	12
Breastfeeding too inconvenient	13
I had been under stress	14
I was too tired	15
Dislike breastfeeding	16

Concern about how breastfeeding will affect your figure 17
Couldn't tell how much baby is drinking 18
My milk wasn't good enough 19
Not enough milk 20
Baby not gaining enough weight 21
Baby no longer interested in the breast 22
Baby biting nipples 23
Baby prefers a bottle 24
Baby ready for solids 25
Baby's ill 26
Mother (I) was ill 27
Use of prescription medication 28
Wanted to go onto oral contraceptive 29
Return to work or study 30
Baby's father preferred formula-feeding 31
Baby's father can help with formula-feeding 32
Other reasons 33
Please specify .....

- For each of the following statements, please indicate how much you agree or disagree **by circling the number that most closely corresponds to your opinion**. The number '1' indicates strong disagreement, whereas '5' indicates strong agreement.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
a	The nutritional benefit of breastmilk last only until the baby is weaned from breastmilk	1	2	3	4	5
b	Formula feeding is more convenient than breastfeeding	1	2	3	4	5
c	Breastfeeding increases mother-infant bonding	1	2	3	4	5
d	Breastmilk is lacking in iron	1	2	3	4	5
e	Formula-fed babies are more likely to be overfed than breastfed babies	1	2	3	4	5
f	. Formula feeding is the better choice if mother plans to work outside the home	1	2	3	4	5
g	Mothers who formula feed miss one of the joys of motherhood	1	2	3	4	5
h	Women should not breastfeed in public places such as restaurants	1	2	3	4	5
i	Breast fed babies are healthier than formula fed babies	1	2	3	4	5

j	Breast fed babies are more likely to be overfed than formula fed babies	1	2	3	4	5
k	Father feels left out if mother breast feeds	1	2	3	4	5
l	Breastmilk is the ideal food for infants	1	2	3	4	5
m	Breastmilk is more easily digested than formula	1	2	3	4	5
n	Formula is as healthy for an infant as breastmilk	1	2	3	4	5
o	Breastfeeding is more convenient than formula feeding	1	2	3	4	5
p	Breastfeeding is less expensive than formula	1	2	3	4	5
q	A mother who occasionally drinks alcohol should not breastfeed her baby	1	2	3	4	5

(Resources: The Iowa Scale)

Section2: Perceptions of body/breast shape

- Please answer all questions by marking the degree to which you agree with each of the following statements.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
a	I place great importance of deal with body shape	1	2	3	4	5
b	I buy a product that promise to give me a better body	1	2	3	4	5
c	I am self-conscious about my body shape	1	2	3	4	5
d	I am not self-conscious about my body shape	1	2	3	4	5
e	I am always trying to improve my body shape	1	2	3	4	5
f	I wear clothes that highlight best aspect of my body and hide the worst aspect of my body	1	2	3	4	5
g	It really bothers me when I cannot keep my body in shape	1	2	3	4	5
h	I am very attentive to my body shape	1	2	3	4	5
i	My breasts lost their firmness	1	2	3	4	5
j	My breasts sagged more because of breastfeeding	1	2	3	4	5
k	My breasts sagged more because of pregnancy	1	2	3	4	5
l	My breasts sagged more because of aging	1	2	3	4	5

m	I am satisfied my current breast shape for my age	1	2	3	4	5
n	My breasts became smaller or reduced after my baby weaned	1	2	3	4	5
o	My breasts became larger after my baby weaned	1	2	3	4	5

(Resource: ABS)

- We should like to know how you have been feeling about your appearance over the **PAST FOUR WEEKS**. Please read each question and circle the appropriate number to the right. Please answer <u>all</u> the questions.

		Never	Rarely	Some times	Often	Very often	Always
a	Have you been afraid that you might become fat (or fatter)?	1	2	3	4	5	6
b	Have you felt excessively large and rounded?	1	2	3	4	5	6
c	Have you thought that you are in the shape you are because you lack self-control?	1	2	3	4	5	6
d	Has seeing your reflection (e.g. in a mirror or shop window) made you feel bad about your shape?	1	2	3	4	5	6
e	Have you been particularly self-conscious about your shape when in the company of other people?	1	2	3	4	5	6

(Resource: BSQ8c)

Section 3: Demographic data

- The following information about you and your last baby will help us to analyse our data.
  We recognise that some of the questions are very personal. Please remember that they will remain strictly confidential.

19 Total number of children ---------- (q19)

20 What is your last child's gender?

Boy 1
Girl 2 (q20)

The date of birth of your last child .....__ __ / __ __ / __ __ (q20.a)

The child's birth weight (gm) ---------- (q20.b)

The child's birth length (cm) ---------- (q20.c)

The child's **<u>current</u>** weight (gm) ---------- (q20.d)

The child's **current** length (cm) ..... (q20.e)

21 What is your postcode? ---------- (q21)

If you don't know the postcode, what suburb do you live in? ----------

22 **Your** date of birth (DD/MM/YY) ..... __ __ / __ __ / __ __ (q22)

23 How tall are you?..... _____ cm (q23)

24 What is **your** occupation? ---------- (q24)

25 What is your **partner's** occupation? ---------- (q25)

26 What is your body weight in following period?

Current body weight (kg) _____ (q26.a)

Before first pregnancy (kg) _____ (q26.b)

Before the recent pregnancy (kg) _____ (q26.c)

27 Currently, do you feel your body weight return as pre-pregnancy?

Yes----------**GO TO Q28**..... 1 (q27)
No ----------**GO TO Q29** 2

28 **When** did you return your body weight as pre-pregnancy?

1-2moths after birth 1 (q28)
3-4 months after birth 2
5-6 months after births..... 3
7-8 months after births..... 4
9-10months after births..... 5
1year after birth 6

29 Currently, do you feel your breast shape return before pregnancy?

Yes----------**GO TO Q31**..... 1 (q30)
No ----------**GO TO Q32** 2

31 **When** did you return your breast shape before pregnancy?

1-2moths after birth 1 (q31)
3-4 months after birth 2
5-6 months after births..... 3
7-8 months after births..... 4
9-10months after births..... 5
1year after birth 6

32 What is your marital status?

Never married 1 (q32)

Now married 2
Defacto 3
Divorced or separated 4
Widowed 5

33 Are you currently taking an oral birth control pill?

Yes----------**GO TO Q34** 1 (q33)
No ----------**GO TO Q34**..... 2

34 In what country were you born? ---------- .... (q34.a)

35a Did you attend some workshop, antenatal class or lecture to return your body shape back to pre-pregnancy?

Yes ----------**GO TO Q35b**..... 1 (q35.a)
No----------**GO TO Q36** 2

35b **What** did you do?

Attended antenatal class 1 (q35.b)
On special diet 2
Did exercise 3
Wear special bra, underwear..... 4
Others (Please specify) _____

35c **When** did you start it to regains your body shape ?

1-2moths after birth 1 (q35c)
3-4 months after birth 2
5-6 months after births..... 3
7-8 months after births..... 4
9-10months after births..... 5
1year after birth 6

36 Your education level

Left school before Year 10 ..... 1 (q36)
Junior/achievement certificate/Year 10 or equivalent 2
TEE/TAE/leaving (Year 12 or equivalent) 3
Trade, diploma or TAFE course e.g., hairdressing, business studies..... 4
Bachelor degree or higher..... 5

Other (Please specify).....

37 Are you smoking?

Yes---------- **GO TO Q38**..... 1 (q37)
No----------**GO TO Q39a**..... 2
Usually, but not at the moment
GO TO Q39a..... 3

38 How many cigarettes do you smoke per day on average?

Less than 5 1		(q38)
5 to 9 2		
20 o 19 3		
20 to 30 4		
More than 30 5		

39a Does anyone else who lives in your household smoke?

Yes----------**GO TO Q39b** 1	(q39.a)
No---------- **GO TO Q40** 2	

39b Who smoke?

Children's father 1	(q39.b)
Other person 2	
Others (Please specify) _____	

40 Do you have a private health insurance?

No 1	(q40)
Yes, auxiliary only (extra cover) 2	
Yes, hospitals cover 3	
Others (Please specify) _____	

41 Approximate total yearly family income (yen)

Below 2,500,000 1	(q41)
2,500,001-4,500,000 2	
4,500,001-6,500,000 3	
6,500,001-8,500,000 4	
Above 8,500,001 5	

Thank you very much for your participation.